A Dissertation on

A COMPARATIVE STUDY OF EASE OF INSERTION, HEMODYNAMIC CHANGES AND POSTOPERATIVE ADVERSE EVENTS OF PROSEAL LARYNGEAL MASK AIRWAY VERSUS I GEL

Dissertation submitted to

THE TAMILNADU DR.M.G.R. MEDICAL UNIVERSITY

CHENNAI - 32, TAMIL NADU

in partial fulfilment of the regulations For the award of the degree of

M.D. DEGREE EXAMINATION

BRANCH X – ANAESTHESIOLOGY

COIMBATORE MEDICAL COLLEGE HOSPITAL

COIMBATORE

APRIL 2016

Coimbatore Medical College

COIMBATORE, TAMILNADU, INDIA - 641 014

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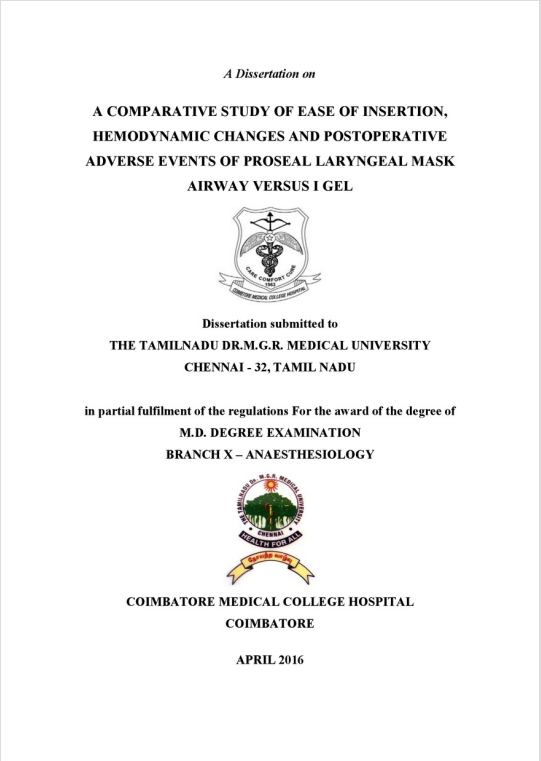

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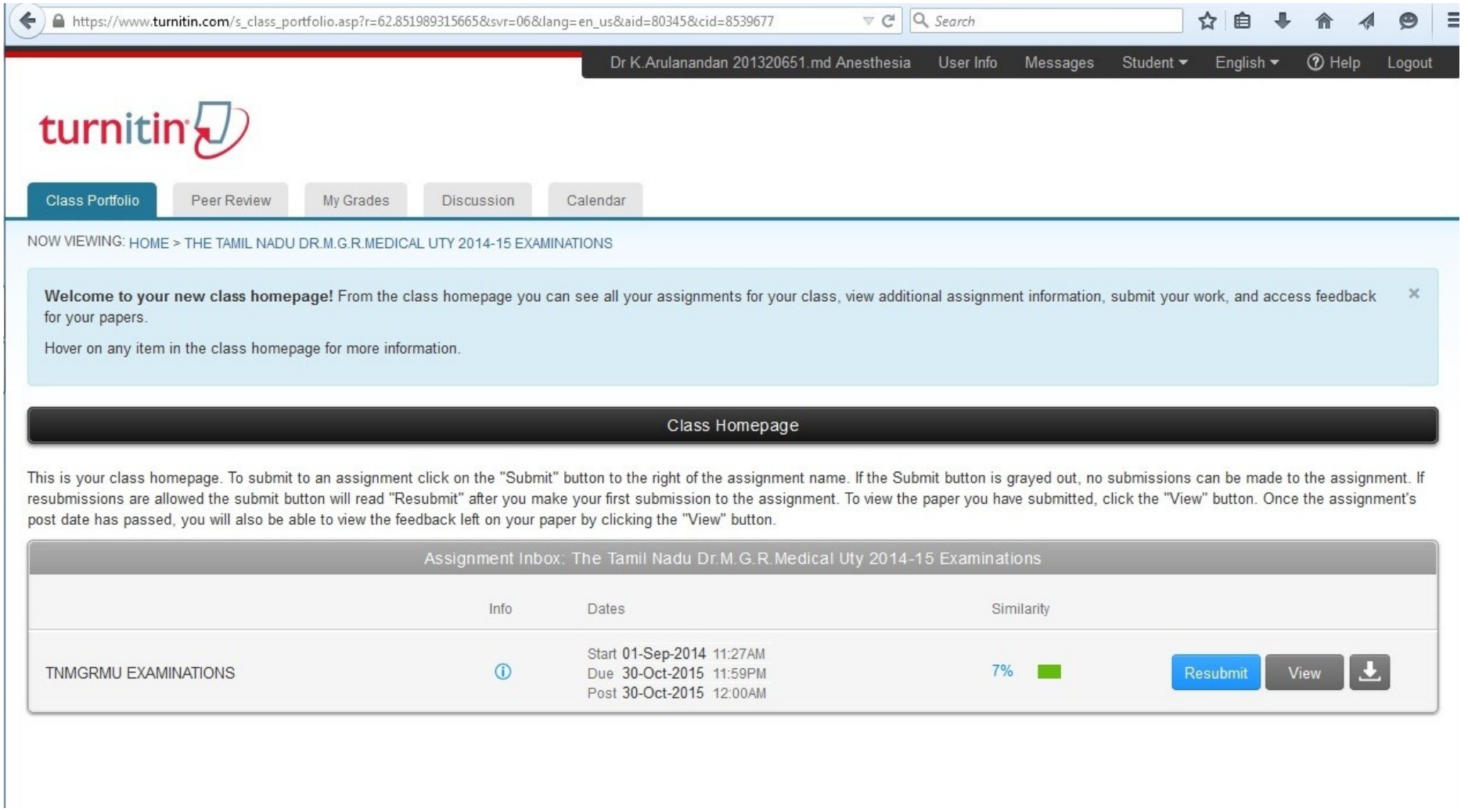
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DECLARATION BY THE CANDIDATE

I hereby declare that this dissertation titled "**A COMPARATIVE STUDY OF EASE OF INSERTION, HEMODYNAMIC CHANGES AND POSTOPERATIVE ADVERSE EVENTS OF PROSEAL LARYNGEAL MASK AIRWAY VERSUS I GEL"** is a bonafide and genuine research work carried out by me under the guidance of **Dr.K.S.SUGANTHI M.D.,D.A., Professor Department of Anaesthesiology, Coimbatore Medical College and Hospital** Tamil Nadu, India.

Date: Signature of the Candidate

Place : Coimbatore **Dr. K.ARULANANDAN**

ACKNOWLEDGEMENT

I am extremely thankful to Prof. **Dr. A. EDWIN JOE M.D., B.L.,** Dean, Coimbatore Medical College and hospital, for his kind permission to carry out this study.

I am immensely grateful to Professor **Dr. K. SANTHA ARULMOZHI M.D., D.A.,** Professor and Head of Department of Anaesthesiology, Coimbatore Medical College and Hospital for her concern and support in conducting the study.

I am greatly indebted to my guide **Dr. K.S. SUGANTHI M.D., D.A.,** Professor Department of Anaesthesiology, Coimbatore Medical College and Hospital for her inspiration, guidance and comments at all stages of this study.

I am greatly indebted to my co – guide **Dr.G.SHANMUGAVELU M.D.,** Assistant professor, Department of Anaesthesiology, Coimbatore Medical College and Hospital for his inspiration, guidance and comments at all stages of this study.

I am thankful to **Dr. T.SADAGOPAN M.D., Dr.A.JEYABASKARAN M.D., Dr. K.KALYANANSUNDARAM M.D.,** Professors, for their suggestion in making this work complete.

I am thankful to all assistant professors for their guidance and help. I am thankful to all my colleagues for the help rendered in carrying out this dissertation.

I am thankful to **Dr. ELANGO. MS** Professor and Head of Department of General surgery and **Dr. B.ASOKAN MS, MCH** Professor and Head of Department of plastic surgery, Coimbatore Medical College and Hospital.

I thank all the patients for willingly submitting themselves for this study.

Dr. K.ARULANANDAN

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INTRODUCTION

INTRODUCTION

Supraglottic airway devices are used to ventilate patients above the vocal cords. For years, the airway management was emphasized largely on successful tracheal intubation. The development of the laryngeal mask airway has changed the focus of airway management, from intubation to oxygenation and ventilation. LMA is an improved device for securing the airway during emergency and anaesthesia management.

LMA is a new device whose status regarding the management of airway lies somewhere between the facemask with oropharyngeal airway and ETT. This is because it provides more definite airway than the former, but not more reliable airway protection and maintenance than ETT. It sometimes acts as an essential airway device to provide emergency airway and ventilation when routine mask ventilation and attempts to intubate fails.

LMA development and utilization has improved over years throughout world. The LMA is widely accepted as a form of airway management in the emergency situation by the paramedics and inexperienced personnel. They provide hands free airway and easier placement even by above personnel along with a relatively secure airway. LMA can be used in both anticipated and unanticipated difficult airway.

Dr .Archie Brain in the United Kingdom introduced the first LMA classic in 1989. They are less invasive for respiratory tract, have improved hemodynamic stability and better tolerated by patients with ease of placement.

In 2000, Dr Archie Brain introduced a new design Proseal LMA to provide airway protection in full stomach patients to prevent aspiration. Modification in PLMA provides effective separation of GIT and respiratory tract, improved the airway seal and provides good effective controlled ventilation. So it reduces the risk of regurgitation and aspiration.

A new supraglottic airway device is I GEL. It is a non cuffed device containing drainage tube to prevent regurgitation and aspiration of gastric contents. IGEL is designed to create anatomical seal to the perilaryngeal structures.

AIMS AND OBJECTIVES

AIM OF THE STUDY

The main aim of this study is to compare the two supraglottic airway devices, IGEL with Proseal LMA in clinical performance in elective **short** surgeries with **spontaneous ventilation**.

OBJECTIVES OF THE STUDY

1. To compare the ease of insertion.
2. To compare number of attempts.
3. To compare hemodynamic changes during
    - Insertion,
    - Intraoperative period,
    - Removal.
4. To compare airway trauma, blood staining of device and incidence of complication like bronchospasm, laryngospasm, sorethroat, vomiting, regurgitation, hoarseness of voice.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

STRUCTURE AND FUNCTION OF THE UPPER AIRWAYS [6]

The passage through which air passes into and out of lungs during respiration is defined as airway. Airway divided into an upper airway and lower airway.

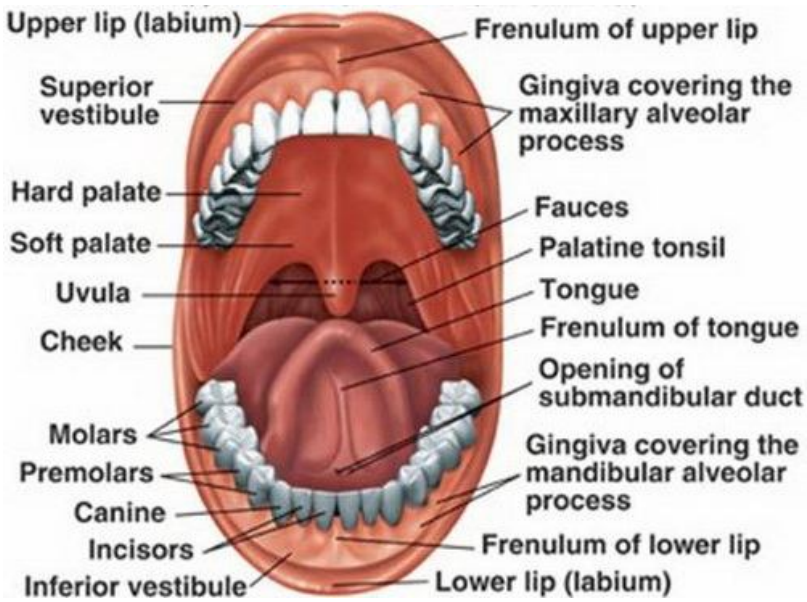
Upper airway consist

- Mouth, nasopharynx, oropharynx and larynx.

Lower airway consist

- Trachea,
- Bronchi,
- Bronchioles
- Alveoli.

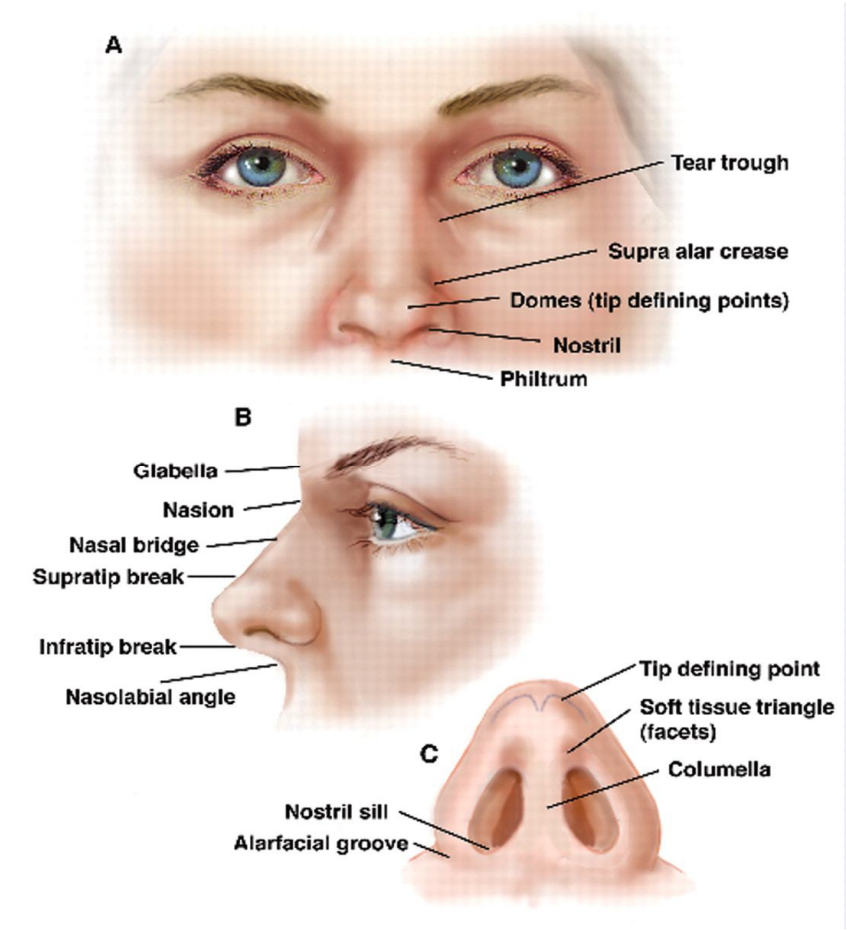
ORAL CAVITY (Figure 1)



MOUTH:

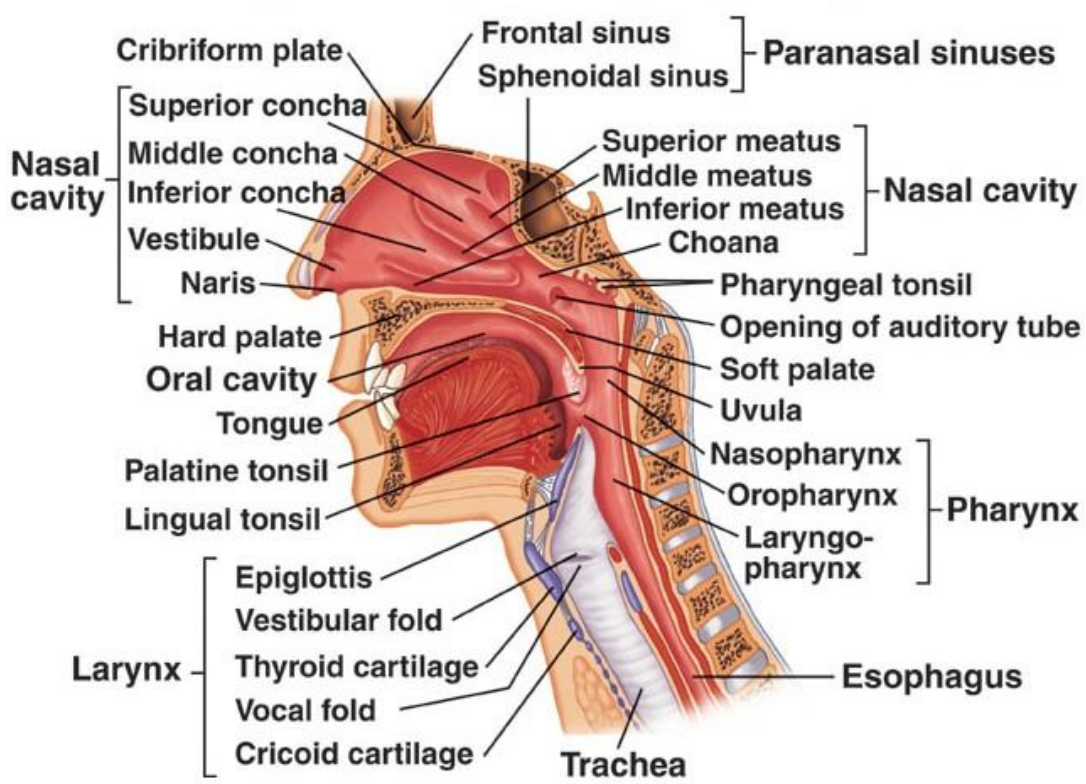
It extends from mouth opening to anterior tonsillar pillars. It includes lips. Cheeks are made up of muscle and buccal fat. The floor of mouth has soft tissue and has opening of submandibular glands. It is also occupied by the tongue. The mouth cavity is formed by maxilla, mandible and teeth in front, above by hard palate and soft palate, below by anterior 2/3 of tongue. For effective airway management ability to maintain good mouth opening is more important.

EXTERNAL NOSE :(Figure 2)



LATERAL VIEW OF NASAL, ORAL PHARYNX AND LARYNX:

(Figure 3)



NOSTRILS:

It is a pyramid like projection on the face. It's present as free tip and a root at its junction with the forehead. Alae nasi are the lateral margins of the nostril. The distances from alae nasi to various points on the external ears are used to estimate the length of airway devices. The framework of the nose has formed by some bones and cartilages. The upper part is supported by bones like nasal bone, frontal process of maxillary bone and nasal part of frontal bone.

NASAL CAVITY:

Nasal cavity is triangular in shape and an irregular surface. It is separated into right and left halves of nasal cavity by nasal septum. Each halves of nasal cavity extends from anterior nares to nasopharynx posteriorly. It is the narrowest part of the upper airway. The roof of the cavity is formed by the cribriform plate of ethmoid. The floor of the cavity is formed by the palatine process of maxilla and palatine bone. The lateral wall is irregular due to presence of 3 conchae. It has opening of paranasal sinus. The important function of the nasal cavity is warming and humidification of air as it passes through the nose.

PHARYNX:

The pharynx is a fibro muscular structure. It extends from the base of the skull up to the level of the 6^{th} cervical vertebra or cricoid cartilage. It becomes continuous with the oesophagus and larynx.

Pharynx divided into

- Nasopharynx

- Oropharynx

NASOPHARYNX:

It extends above from the base of skull up to the level of soft and hard palate below. It communicates with nasopharynx through the posterior nares. It consists of the nasal cavity, septum, turbinate's and adenoids. It bounded posteriorly by the C1 and C2 vertebral body.

OROPHARYNX:

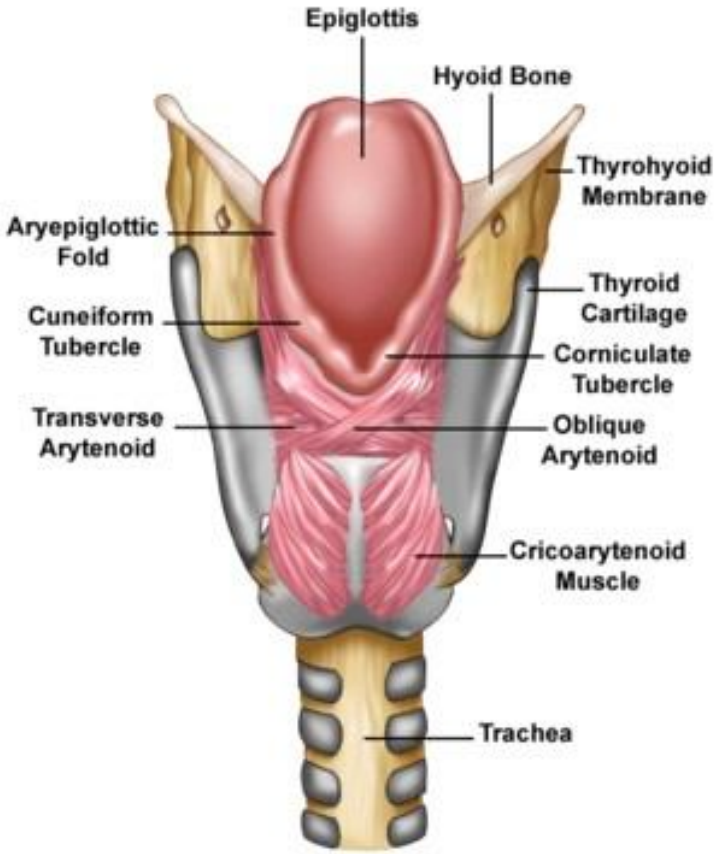
Oropharynx extends from hard and soft palate above to hyoid bone below. Below it is bounded by base of the tongue up to the epiglottis. It includes the tonsils, uvula and epiglottis. The valecula is the space between epiglottis and the base of the tongue and has paired depressions of the two sides of the median glossoepiglottic fold.

Laryngoscope blade tip lies in vallecula during classical laryngoscopy. Upward pressure with laryngoscopy blade on the vallecula produces the elevation of larynx and alignment of pharyngeal and laryngeal axes.

LARYNX:

It extends from the laryngeal inlet to the lower border of cricoids cartilage. It acts as an organ of voice and protects the lower airway as an inlet valve from the contents of the GIT. It lies at level of C3 to C6 body of vertebrae. It moves vertically and anteroposteriorly during swallowing and phonation. Larynx includes cartilages which are paired and unpaired. Three unpaired cartilages include the thyroid, cricoid, and epiglottis. While paired 3 cartilages includes the arytenoids, corniculates and cuneiforms.

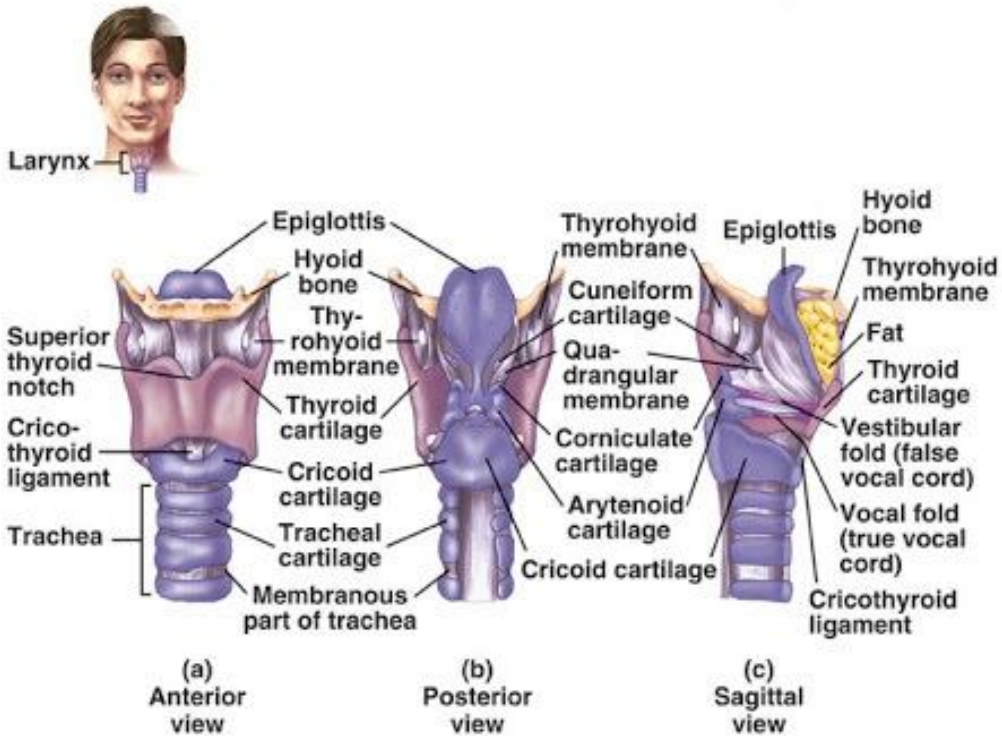
LARYNGEAL CARTILAGES: (Figure 5)



The epiglottis is leaf like cartilage. It has broad free upper margin. Its lower end attached to angle between 2 laminae of the thyroid cartilage. A median glossoepiglottic fold and 2 lateral glossoepiglottic folds connects the epiglottis to the base of the tongue.

The thyroid cartilage is the largest of the laryngeal cartilages. It is v shaped cartilage and is made up of 2 quadrilateral laminae. In male, the line of junction formed by 2 laminae called Adams apple. Vocal cords are attached to its middle.

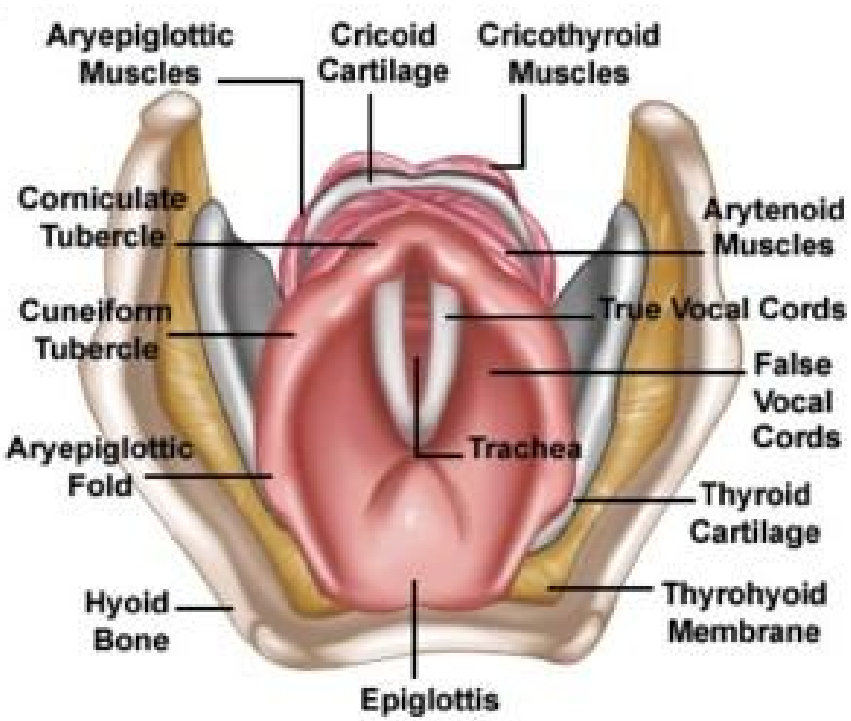
LARYNX :(Figure 4)



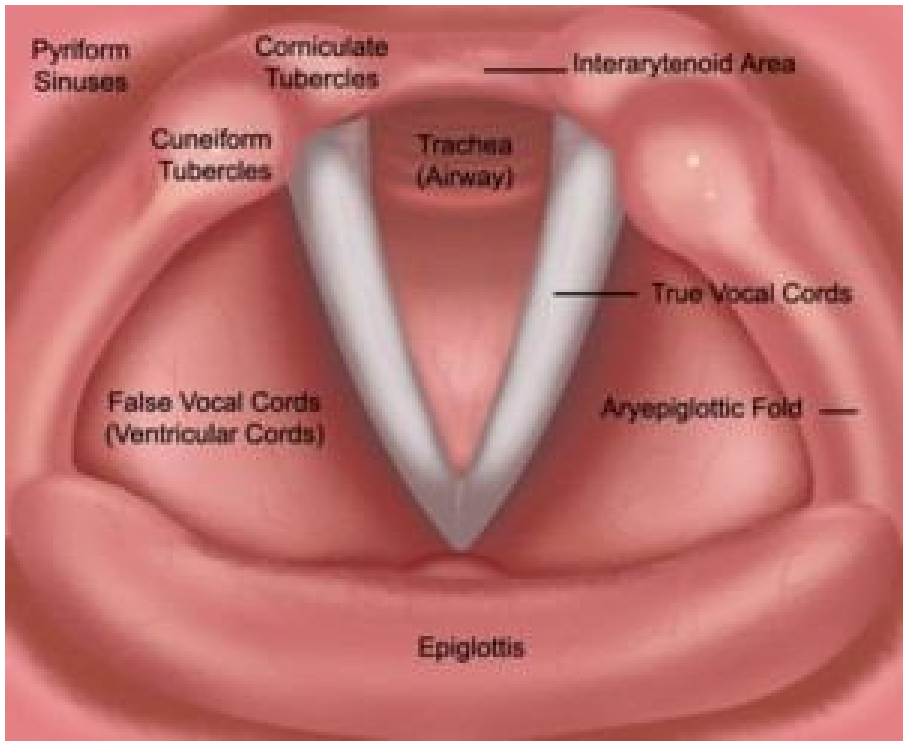
The cricoid is the only complete ring cartilage. It resembles signet shaped ring. In the children the cricoid is the narrowest part of the airway. A membrane which extends from cricoid to thyroid in anteriorly is known as the cricothyroid ligament. The upper free border of this conus elasticus membrane forms the vocal cord.

Arytenoids are pyramidal in shape. The apex of the arytenoids articulates with corniculate and cuneiform cartilage. Vocal cord is attached to the vocal process of the arytenoids cartilage. Corniculates lies at the apex of arytenoids. Cuneiforms are rods shaped and it is situated in front of corniculate.

LARYNGEAL CARTILAGES : (Figure 6)



VOCAL CORD: (Figure 7)



LARYNGEAL MASK AIRWAY[6, 7]

CLASSIFICATION OF SUPRAGLOTTIC DEVICE:

FIRST GENERATION DEVICES	**SECOND GENERATION DEVICES**
SIMPLE AIRWAY TUBES	WITH ADDITION OF DRAINAGE TUBE
➢ The Laryngeal Mask Airway (Classic LMA). ➢ Flexible LMA. ➢ Unique LMA. ➢ Cobra Perilaryngeal Airway.	➢ Proseal LMA. ➢ I-GEL, Laryngeal Tube. ➢ LMA Supreme. ➢ Streamlined Liner of the Pharyngeal Airway.

1. LARYNGEAL MASK AIRWAY FAMILY:
➢ LMA Classic ➢ LMA Unique ➢ LMA Flexible ➢ LMA Fastrach ➢ LMA Ctrach ➢ LMA Proseal
2. OTHER SUPRAGLOTTIC AIRWAYS SIMILAR TO LARYNGEAL MASK:
➢ Soft Seal Laryngeal Mask ➢ Ambu Laryngeal Mask ➢ Intubating Laryngeal Airway
3. OTHER SUPRAGLOTTIC AIRWAY DEVICES:
➢ Laryngeal Tube Airway ➢ Perilaryngeal Airway ➢ Streamlined Pharynx Airway Liner

BASED ON GENERATION

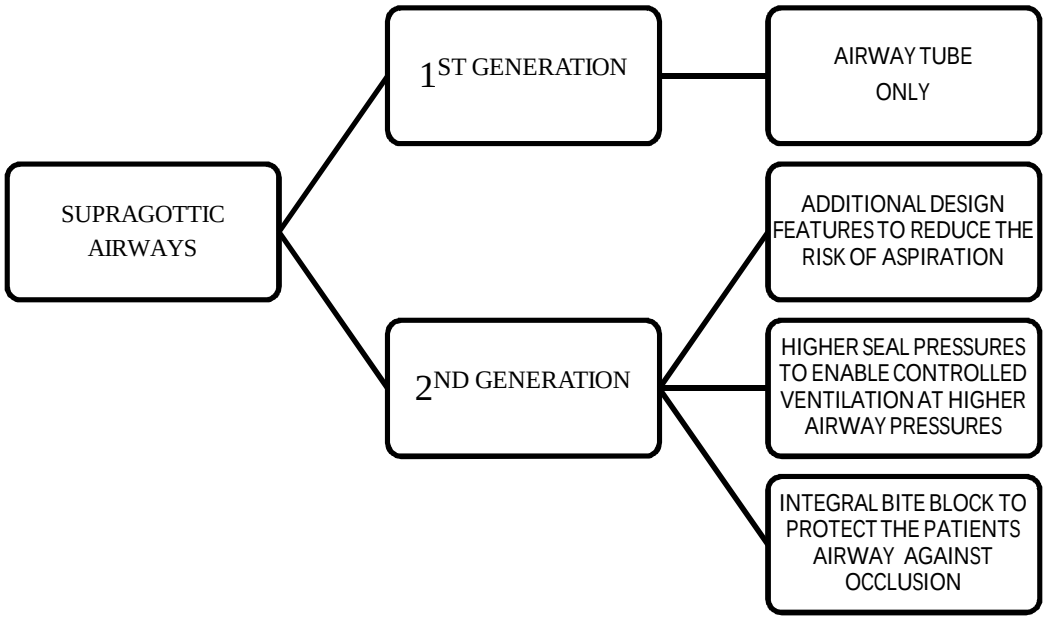
FIRST GENERATION	SECOND GENERATION
• Simple airway • Low pressure pharyngeal seal • May or may not protect from aspiration • Have no specific design to lessen the risk • Eg: CLMA Flexible LMA Laryngeal Tube Cobra Perilaryngeal Airway	• Specially designed for safety • High pressure pharyngeal seal • Reduce the risk of aspiration • May be more efficacious in ventilation • Eg: PLMA Supreme LMA I- Gel SLIPA

BASED SEALING MECHANISM

Cuffed peri laryngeal sealer	Cuffed pharyngeal sealer	Cuff less preshaped sealer
• Non directional non esophageal sealers – CLMA, Flexible LMA, Unique LMA • Directional non esophageal sealing – Fastrach LMA, ALMA. • Directional esophageal sealing – PROSEAL, Supreme LMA.	• Without esophageal sealing – COPA, PAX. • With esophageal sealing – Combitube, LT, LTS.	• With esophageal sealing – I –GEL, BASKA • Without esophageal sealing – SLIPA, AIRQ

BASED ON NO OF LUMEN

Single lumen devices	CLMA, Flexible, Unique, ILMA, Ambu, Cobra, SLIPA, Laryngeal Tube
Double lumen devices	Proseal LMA, Combitube, Airway Management Device
Triple lumen devices	Elisha Airway Device



FEATURES OF AN IDEAL SAD:

- During both spontaneous and positive pressure ventilation, an efficient seal of the upper airway must.
- Low resistance to gas flow.
- Protects airway from upper airway secretions and GIT contents.
- Incidence of airway morbidity and adverse events are low.
- It is easily accepted by the oropharynx as in shape, material, cuff volume and cuff position.

BASIC DESIGN AND DESCRIBTION OF LMA:

In past 20 years LMA is the single most important device in development of airway device. It is designed for airway management of cases with spontaneous ventilation. LMA has been listed in the ASA difficult airway algorithm in five different places as an airway or a conduit for ETT intubation.

LMA classic is a reusable device. It includes a bowl shaped mask. The mask is bordered by an oval, inflatable, cuff made up of silicone is designed to seal around the laryngeal inlet. The components of the LMA includes an airway tube cuff and mask inflation line. The airway tube is a big bore tube and it has 15 millimetre male adapter standard sizes. The opposite end is attached to a mask which has an

inflatable cuff. The mask of LMA is specially designed to fit to the anatomy of the hypopharynx.

Two elastic bars at distal opening of the cuff are called aperture bars. It prevents obstruction by epiglottis. An inflation tube and self-sealing pilot balloon are present at the proximal end of the tube. LMA contains no latex. It is reusable 40 times and sterilized by stream autoclaving. The intracuff pressure is recommended for LMA maximum level is less than 60 mm H2O. This is the perfusion pressure of the pharyngeal mucosa. If the pressure is above this level produce pharyngeal mucosal injury and increase the sore throat incidence.

The LMA is available currently in eight sizes.

Available LMA classics	
LMA SIZE	**PATIENT SIZE**
1	Neonates/infants upto 5 kg
1.5	Infant between 5 and 10 kg
2	Infants / children between 10 and 20 kg
2.5	Children between 20 and 30 kg
3	Children 30 to 50 kg
4	Adults 50 to 70 kg
5	Adults 70 to 100 kg
6	Adult over 100 kg

ADVANTAGES OF LMA:

- Less stimulation of sympathetic system leading to lower hemodynamic instability
- The patient even in light plane of anaesthesia better tolerates it.
- Ease of insertion and smooth recovery.
- Avoidance of laryngoscopy and muscle relaxant.
- They do not displace bacterial colony from oral or nasal to lower respiratory tract.
- In case of cannot ventilate, cannot intubate situation it is used as a life saving device in securing the airway.
- Less injury to airway compared to ETT.
- Pollution to operating room is less compared to face mask.
- Recovery and emergence time is less.

DISADVANTAGES AND CONTRINDICATION OF LMA:

- It does not provide protection against aspiration so contraindication in full stomach patient.
- Not useful in patient with glottis and supraglottic obstruction, or pathology.
- It is not a definite airway.

- Patient with poor lung compliance cannot be recommended as it needs high inflation pressure.
- Patient with less mouth opening.
- Oral and cervical pathology like large goitre, tumour.

INDICATIONS OF LMA:

- Elective surgeries like short elective surgical procedure as an alternative to ETT intubation.
- Anticipated and unanticipated difficult airway.
- In situation like cannot ventilate and cannot intubate.
- In cardiac arrest – during CPR as an alternative to ETT intubation.
- Used as conduit for ETT insertion when difficult intubation occur.
- Useful in radiation therapy, diagnostic and interventional radiology, ECT, endoscopy.
- As a bridge to extubation.
- Ophthalmic, neurosurgery, unstable cervical spine, supplementing regional block – useful in above procedures.

COMPLICATION OF LMA:

- Gastric contents aspiration.
- Gastric distension.
- Complete or partial airway obstruction.
- Traumatic injuries to the tongue, soft palate, uvula, tonsils, epiglottis and pharyngeal mucosa.
- Dislodgement occurs accidentally when not in proper position, cuff is overinflated or inappropriate size is used.
- Damage to LMA, failure to inflate or deflate can occur.
- Bronchospasm, dysphagia and nerve injury may occur during LMA use.

PROSEAL LMA[6, 7]

Proseal Laryngeal mask airway was developed and introduced by Dr. Archie brain in year of 2000. It was developed in order to prevent aspiration and for effective positive pressure ventilation.

DESCRIPTION OF PROSEAL LMA:

It has following parts mask, airway tube, pilot balloon with inflation line, drain tube. It is made up of silicone and is reusable. All components are latex free. There are 6 sizes available now.

LMA PROSEAL						
LMA size	Patient size (kg)	Maximum cuff inflation volume (ml)	Maximum gastric tube size (French)	Maximum fiberoptic scope size (mm)	Length of drain tube (cm)	Largest tracheal tube (ID in mm)
1.5	5 – 10	7	10	-	18.2	4.0 uncuffed
2	10 – 20	10	10	-	19.0	4.0 uncuffed
2.5	20 – 30	14	14	-	23.0	4.5 uncuffed
3	30 – 50	20	16	-	26.5	5.0 uncuffed
4	50 – 70	30	16	4	27.5	5.0 uncuffed
5	70 - 100	40	18	5	28.5	6.0 cuffed

Maximum test cuff inflation volumes		
Size	**LMA classic (mL)**	**LMA Proseal (mL)**
1	6	-
1.5	10	-
2	15	-
2.5	21	-
3	30	-
4	45	45
5	60	60
6	75	-

Maximum cuff dimensions				
Mask size	**Air volume**	**Maximum bulge of cuff tip (mm)**	**Maximum bulge of wide end of cuff (mm)**	**Maximum transverse diameter of cuff (mm)**
1	6	7.8	8.6	26.3
1.5	10	9.5	10.2	32.6
2	15	11.5	13.0	39.0
2.5	21	13.0	14.5	45.0
3	30	14.8	16.6	51.2
4	45	17.0	19.0	58.5
5	60	21.1	22.4	68.3

LMA Property	Classic LMA	Supreme LMA	Ambu AuraGain	Fastrach iLMA	AirQ iLMA
Affordability	Cheap	Mod	Mod	Expensive	Mod
Pack size	Small	Small	Small	Large	Small
Integral bite block	No	YES	YES	YES	YES
Gastric drainage channel	No	YES	YES	No	YES
Conduit for LMA	No	No	YES	YES	YES
- blind intubation? - malleable FO stylet? - flexible FO scope?	NA NA NA	NA NA NA	No YES YES	YES No YES	YES YES YES
Adjuncts	NA	NA	NA	NA	Bronchoscope adaptor Orogastric tube
Ventiation pressure	Low	High	Med	Med	High
Ease of removal	Easy	Easy	Easy	Difficult	Moderate

Features of the LMA ProSeal™, LMA Supreme™ and i-gel™ supraglottic airway devices†

	LMA ProSeal™	LMA Supreme™	i-gel™
Oesophageal drain tube	✔	✔	✔ Narrow bore
Inflatable cuff	✔ Posterior cuff	✔ No posterior cuff	✘ Cuffless
Airway tube	Reinforced	Pre-formed, semi-rigid	Short, wide bore
Integral bite block	✔	✔	✔
Introducer	✔	✘	✘
Single use	✘	✔	✔
Fins in mask bowl‡	✘	✔	✘

† The coloured symbols represent data taken from sources other than the cited publication, and are included for completeness

‡ Prevents obstruction by the epiglottis

The cuff is intended to fit to the anatomy of the perilaryngeal structures, with its lumen in front of the laryngeal opening. It has a large ventral cuff that is attached to a second rear cuff which is attached to the dorsal surface of the mask. This rear cuff helps to improve seal around periglottic tissue. This rear cuff arrangement makes the proseal LMA withstand higher seal pressure of 35 cm H2O.

Airway tube is short and smaller than classic LMA. The airway tube is wire reinforced which makes it flexible and prevents collapse. Its end connected to 15 mm connector. Distal tube have insertion slot for the introducer tool. The PLMA bowl is deeper and does not have aperture bars. The drainage tube traverses the cuff to open distally. This is parallel and lateral to airway tube. This facilitates passing gastric tube, Doppler probe, thermometer and stethoscope into the oesophagus. This tube is intended to divert regurgitated fluids and prevent gastric insufflations. The position tube within the bowl is designed to prevent the epiglottis occluding the airway tube, so aperture bar not required. Hence resistance to gas flow reduced.

The double tube design has important role to provide greater stability to the device after insertion. A built in bite block present in proximal end of the tubes to protect the patient from biting. It prevents

obstruction to airway tube. It provides information about depth of insertion. It helps to fuse airway and drainage tube together.

A malleable reusable introducer is available in order to facilitate placement of proseal LMA. It is a curved blade with guiding handle. The distal end fits into introducer strap and the proximal end clips into the tubes.

PLMA is reusable up to forty times. This should be discarded if it fails the pre check test. A rectangular depression of the proximal bowel tube act as an accessory ventilation port and prevents pooling of secretions at distal airway opening.

PRE – PLACEMENT TEST:

Visual inspection:

Examine the transparency of the airway tube. A discoloured tube impairs the ability to see foreign particles or regurgitated fluids. Examine the device for any damage both external and internal.

Flex the tube up to but not beyond 180 degree at the junction of the LMA cuff to the shaft. Do not use if tube kinks at this degree.

Inflation and deflation:

The cuff is fully deflated with syringe so that its wall approximates against each other. Discard the device if it re inflates. Next, inflate the cuff with air and see for any leak or any irregular shape. If any changes present discard the device.

CARE AND CLEANING:

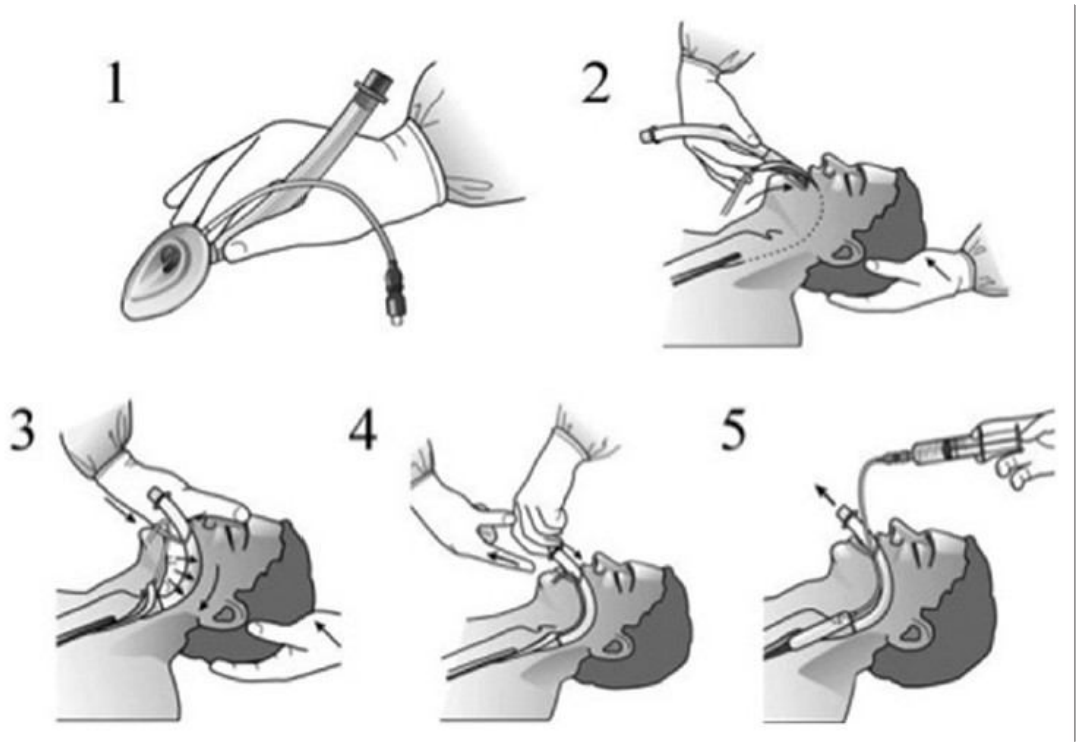
The PLMA is washed in warm water and an 8-10 % dilute sodium bicarbonate solution. Thoroughly wash the PLMA in tap water to clean airway tube, drainage tube and cuff. The inflation valve fails if cleaning solution enters into the valve. Care should be take to prevent valve damage.

The PLMA is sterilized by steam autoclaving method. Before autoclaving the cuff should be fully deflated. Remove all water from the cuff before autoclaving. Temperature used for autoclaving is up to 135 degree Celsius. After sterilization the device should be allowed to cool to room temperature.

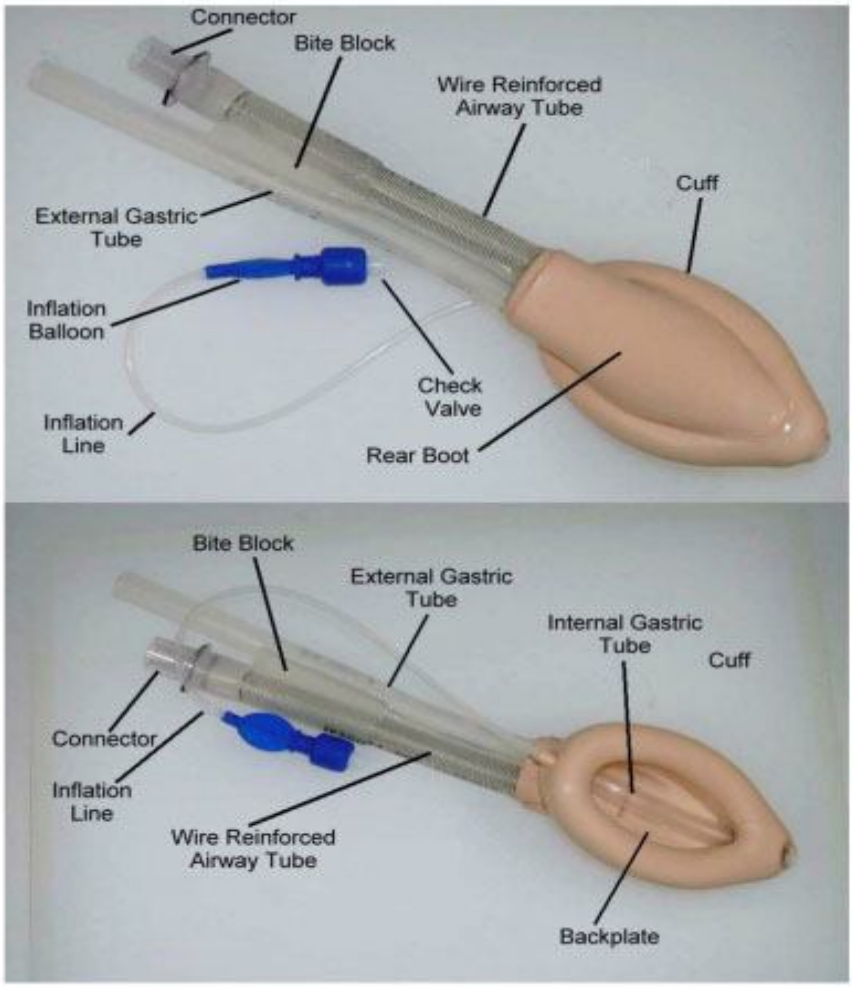
Steam autoclaving of LMA – minimum exposure time:

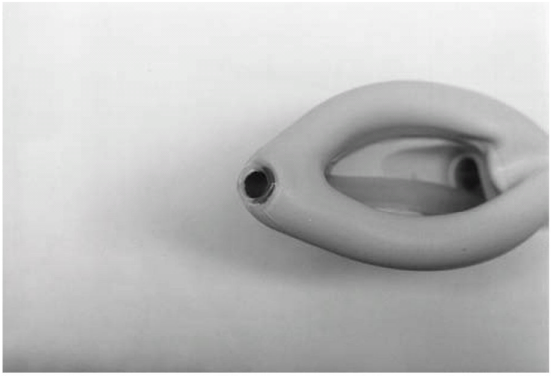
Autoclave	Wrapped	Unwrapped
Gravity displacement	Ten to fifteen min	Ten min
Prevacuum	Three to four min	Four min

LMA INSERTION: (Figure 8)

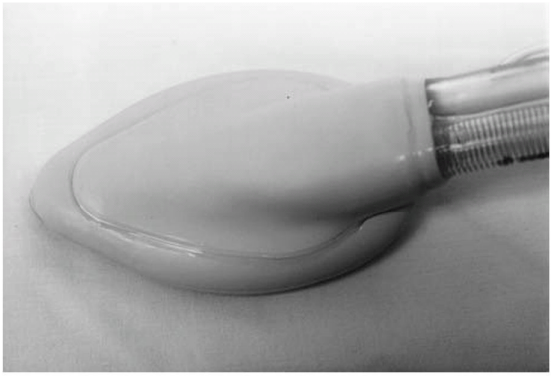


PROSEAL LMA: (FIGURE 9)





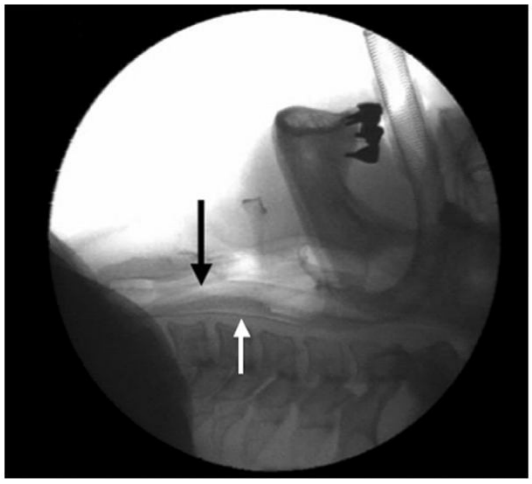
Patient end of LMA-ProSeal. The drain tube continues to an opening in the tip.



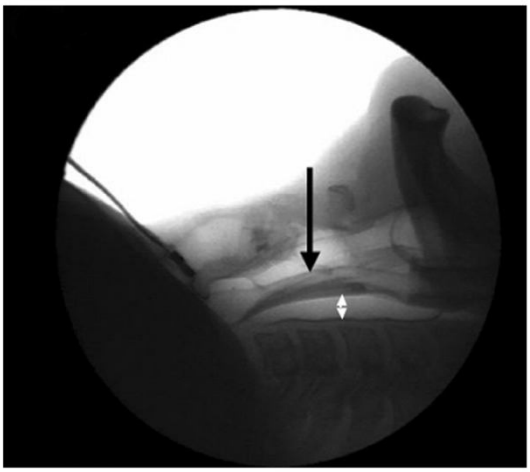
Posterior of the LMA-ProSeal, showing the dorsal cuff.

This picture shows PROSEAL LMA parts

PROSEAL LMA RADIOGRAPH: (Figure 10)

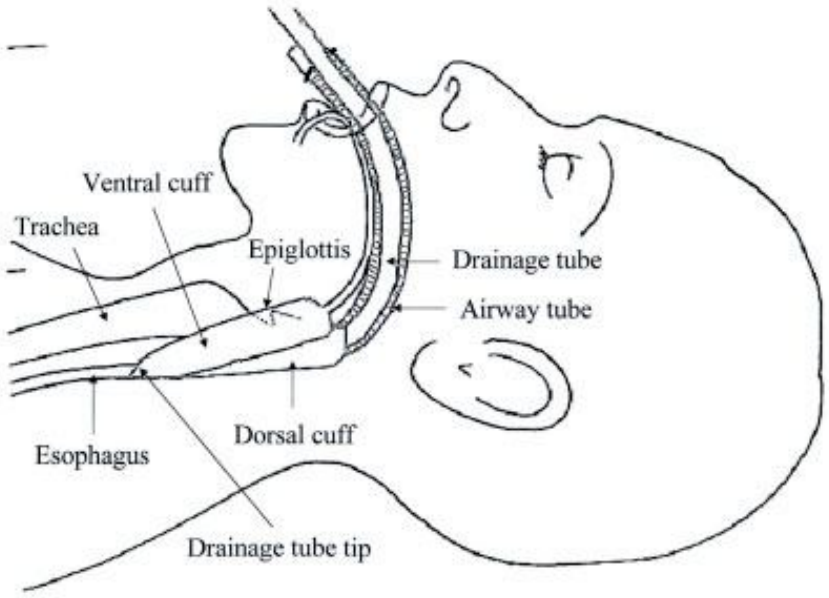


Lateral neck radiograph with the ProSeal laryngeal mask airway (PLMA) in place. When inflated correctly with a pressure up to 60 cm H_2O, the posterior cuff of the mask expands only slightly *(white arrow)*. This ensures the patency of the gastric drain tube *(black arrow)*.



Lateral neck radiograph with the ProSeal laryngeal mask airway (PLMA) in place. If the cuff is inflated with excessive volume, exceeding a pressure of 60 cm H_2O, the gastric drain tube can be partially or completely occluded *(black arrow)* by the bowl of the mask that is pushed toward the glottis by the overinflated cuff *(white double arrow)*.

PROSEAL LMA POSITION: (Figure 11)



Proseal LMA position after insertion

PROSEAL LMA DIFFERENT SIZES: (Figure 12)

Different sizes of Proseal LMA

PROSEAL LMA INTRODUCER: (Figure 13)

INSERTION METHODS:

DIGITAL INSERTION METHOD:

- Patient should be in the sniffing position.
- PLMA cuff deflated to wedge shaped before insertion.
- Index finger positioned to the introducer strap.
- Through vision, press tip of the cuff upwards aligned with the hard palate and flatten the cuff in opposition to it.
- Black line in the airway tube should face anteriorly.
- Using index finger to guide the PLMA and advance into the hypopharynx until an exact resistance felt.
- With non dominant hand press the PLMA before removing the finger. It prevents the LMA coming out from mouth when removing the finger and it allows complete insertion of LMA.
- Ensure that the black line is placed anteriorly in the direction of the upper lip.
- The cuff is inflated with air, corresponding to intracuff pressure of sixty centimetre water.
- During inflation do not hold the LMA as this prevent the correct mask sitting.

- Standard thumb technique also used where access to patient head is difficult from behind. So it will performed by standing on the side of the patient.

SIGNS OF CORRECT PLACEMENT:

- During inflation the cricoid cartilage moves forward, indicates correct placement of mask.
- Slight outward movement of the tube during inflation indicate correct placement.
- Passing drainage tube easily indicate correct placement.
- No cuff is visible through oral cavity.

OTHER INSERTION TECHNIQUES:

- Introducer method.
- Guided method.
- Thumb insertion method.
- 180 degree rotation method.

LMA Property	Classic LMA	Supreme LMA	Ambu AuraGain	Fastrach iLMA	AirQ iLMA
Affordability	Cheap	Mod	Mod	Expensive	Mod
Pack size	Small	Small	Small	Large	Small
Integral bite block	No	YES	YES	YES	YES
Gastric drainage channel	No	YES	YES	No	YES
Conduit for LMA	No	No	YES	YES	YES
- blind intubation? - malleable FO stylet? - flexible FO scope?	NA NA NA	NA NA NA	No YES YES	YES No YES	YES YES YES
Adjuncts	NA	NA	NA	NA	Bronchoscope adaptor Orogastric tube
Ventiation pressure	Low	High	Med	Med	High
Ease of removal	Easy	Easy	Easy	Difficult	Moderate

USES:

PLMA can be used for both spontaneous and controlled ventilation. The PLMA is more suitable for positive pressure ventilation. The cuff sealing pressure is higher level than others. It is more effective in laparoscopic surgery.

DISADVANTAGES:

- Shorter life span.
- With malposition gastric insufflations occur during PPV.
- Insertion is difficult and requires more time.
- Require deeper plane of anaesthesia to insert.
- Less suitable as an intubation device due to narrow airway tube.

I – GEL[6, 7]

I – GEL is the recent addition to SGD developed by intersurgical ltd. It is combination of the concept of drain tube in proseal LMA and uncuffed SGD. The gel like cuff is designed to fit perilaryngeal anatomy. It has the advantage of easier insertion, less tissue trauma and stability. It is a latex free device.

The thermoplastic elastomer a soft gel like material is used to make of I – GEL. It is a transparent material. It creates an anatomical seal without an inflatable cuff. So it avoids the compression injury to perilaryngeal structures that can occur with other inflatable device.

Sizing guidelines for the I- GEL supraglottic airway		
I- GEL size	**Patient size**	**Guide weight (kg)**
1	Newborn	2 - 5
1.5	Infant	5 – 12
2	Small child	10 – 25
2.5	Large child	25 – 35
3	Small adult	30 – 60
4	Medium adult	50 – 90
5	Large adult	90+

Sizing guidelines for inserting an ett through an I – GEL supraglottic airway	
I – GEL size	**Maximum ETT size**
1	3.0
1.5	4.0
2	5.0
2.5	5.0
3	6.0
4	7.0
5	8.0

COMPONENTS OF I – GEL:

- Noninflattable cuff.
- Gastric channel.
- Epiglottic rest.
- Buccal cavity stabilizer.
- Integrated bite block.
- Standard 15 mm port.

The noninflattable cuff fits correctly onto the perilaryngeal anatomy. Its cuff tip lies in the opening of the oesophagus. So it separates

laryngeal opening from oesophagus. It has drain tube opening at the tip. This Soft gel like design ensures the maintaining of blood flow to the perilaryngeal structures and reduces the neurovascular compression.

The proximal end of the cuff contains the epiglottic rest; it avoids the epiglottis from folding / obstruction to the airway. It also prevents upward movement of the device from its position.

I- GEL : (Figure 14)

I- GEL DIFFERENT SIZES: (Figure 15)

The gastric channel is positioned from the proximal opening to the tip of the cuff. It facilitates the passing of drain tube. It prevents regurgitation and gastric insufflations. It is not present in the size 1 device. The distal opening lies at the level of oesophageal opening so it used to empty the stomach contents.

It has a built in buccal cavity stabilizer with an integrated bite block. It is wide, and elliptical. This shape provides improved stability and axial strength this eliminates any malposition and rotation of the device after placement. This firm and curved design helps to insert device easily and smooth manner.

The 15 mm port used to connect the device to the circuit. The bite block contains a black line mark and if it positioned to teeth indicates correct placement of the device. The gastric port situated on the right side of the connector wing is independent to the15 mm port.

INSERTION METHOD:

- Patient in sniffing position.
- Lubricate the device with gel.
- Hold the device firmly along the bite block.
- The cuff should facing towards the chin of the patient.
- Insert the device along the hard palate.
- Gentle push until a definitive resistance is felt.
- The black line marked on the bite block corresponds to the teeth indicates correct placement of the I GEL and its correct seal to perilaryngeal anatomy.

RELAVENT STUDIES

V.UPPAL AND COLLEGUES:

(British journal of anaesthesia 2009 feb: 102(2):264-8)

In anaesthetised, paralysed adults comparative study of I-GEL and LMA was conducted in this study. Assessment of airway pressure, duration of insertion, times and number of insertion were assessed in this study. The mean insertion time for I-GEL was considerably less than classic LMA. Duration of successful insertion is shorter in I-GEL. As per their study, conclusion given by them was I-GEL provides a practical substitute to LMA for controlled ventilation. UPPAL, GANGAIAH, and FLECTHER AND KINSELLA – British journal of anaesthesia 2009 Feb, did the above study: 102(2):264-8[14]

HOHLRIEDER M AND COLLEGUES et al IN 2007

In 200 female patients they assessed postoperative nausea, vomiting, airway related complication for Proseal LMA and ETT. For Proseal LMA the ventilation was better. It also has less airway trauma. Time spent in postop care unit was shorter for Proseal LMA. In postoperative care unit, nausea and vomiting less frequent at all times. Sore throat was less frequent in PLMA. Conclusion given was, for

Proseal LMA the frequency of postoperative nausea, vomiting and airway morbidity requirement are lower when compared to ETT. The above study conducted by HOHLRIEDER M, BRIMACOMBE J, and VON GOEDECKE A, KELLER C et al IN 2007.[30]

ISHWAR SINGH AND COLLEGUES:

(Indian journal of anaesthesia 2009:53(3):302-305)

In elective surgeries, I-GEL & PLMA has compared. Ease of insertion, airway trauma, success rate, post op complication like aspiration and drain tube insertion were assessed by them. They observed the following findings.

- Ease of insertion was easier in I-GEL than PLMA.
- Success of insertion was greater in I-GEL than PLMA.
- Drain tube position achievement rate superior in I-GEL.
- Airway trauma less in I-GEL compared to PLMA.
- No evidence of postop complication like aspiration, laryngospasm in either device.

The above study conducted by ISHWAR SINGH, MONIKA GUPTA, MANSI TANDON - Indian journal of anaesthesia 2009:53(3):302-305.[22]

RICHEZ B, SALTEL L, BANCHEREAU F:

(Anesth. Analg 2008; 106:1137-39)

Insertion success rate was 97% and effortless in all cases. In all cases drain tube insertion was successful. Cough and sore throat occurred in one patient. The above study conducted by Richez and colleagues with I-GEL in 71 women.[11] (Anesth. Analg 2008; 106:1137-39)

KANNAUJIA AND COLLEAGUES:

Kannaujia and colleagues conducted a study of I-GEL in 50 cases. They found that insertion was success in 1st attempt was 90% and 2nd was 100%. 11 seconds was the median insertion time. 100% was the achievement rate for gastric tube insertion. Mean airway leak pressure was twenty centimetre water. It had nil adverse events.

J.J GATWARD, T.M.COOK, C.SELLER:

(Anaesthesia, 2008, 63 pages 1124-1130)

A study was conducted among 100 patients about use of I-GEL. In 86 cases 1st attempt successful, eleven cases at second attempt, three cases inserted at 3rd attempt. Fifteen seconds was the median insertion time. There was single episode of regurgitation. They conclude that I-GEL was easier to insert and provides an effective airway in ninety

percent of the patients. J.J GATEWARD and colleagues – Anaesthesia, 2008, 63 pages 1124-1130, conducted this.

AMR M HELMY, HOSSAM M ATEF, EZZAT M EL-TAHER, AHMED MOSAAD HENIDAK:

(Saudi journal of anaesthesia 2010; 4:131-36)

A study was conducted to compare I-GEL and classic LMA by Helmy and co-workers [10]during spontaneous ventilation. There was no significant hemodynamic change between 2 groups. The insertion time was faster for I-GEL compared to LMA classic (I-GEL – 15.6 ± 4.9 sec, LMA classic – 26.2 ± 17.7 sec). I – GEL (25.6 ± 4.9) produced a higher leak pressure than classic LMA (21.2 ± 7.7) (p = 0.016). The gastric insufflation was less in I-GEL (5%) than classic LMA (23%).

GIUSEPPA NATALINI, GABRIELLA LANZA, ANTONIO ROSANO et al IN 2003[27]

A comparative study of proseal LMA and LMA in obese cases was conducted by G.Natalini and colleagues et al IN 2003[27]. 60 cases were included in study. Air cuffs inflated to sixty cm of water. Controlled ventilation with ten cm of water of PEEP used. They found that leak fraction was six percent in PLMA group than second group. With above

study they concluded Proseal LMA was better than LMA in obese patients.

This study conducted by Giusepee natalini and colleagues et al IN 2002. They compared the Proseal LMA and LMA classic in laparoscopic surgery with controlled ventilation. They studied the frequency of airway seal and sore throat in both group. In Proseal LMA the leak fraction was 7 ± 4% and in LMA – C 7 ± 32% with p valve of 0.731. The frequency of sore throat was less in PLMA compared to LMA – C.

PIPER SN, TRIEM JG, ROHM KD, MALECK WH, SCHOLLHORN TA, BOLDT J, et al IN 2004

The Proseal LMA was compared with ETT in 104 patients undergoing gynaecological laparoscopic surgery. The mean arterial pressure and heart rate was measured in both group. The Mean arterial pressure and Heart rate was lower in Proseal group than ETT (MAP - 92 ± 13 versus 100 ± 14 mmHg with p value of less than 0.001) (HR – 66 ± 13 versus 76 ± 14 / min with p value of less than 0.01). There was no significant difference in sore throat occurrence. When compared to ETT the insertion was easier in PLMA. With above study they concluded that Proseal LMA was better and convenient than ETT in laparoscopic surgeries. This study conducted by Piper sn and colleagues et al IN 2004.

SHIN WJ, CHEONG YS. YANG HS:

(European Journal of Anaesthesia 2009 Nov.12)

Shin.wj and colleague[29] compared PLMA, I-GEL and LMA-C to assess insertion success rate, hemodynamic changes, seal pressure and postop complication. They found that insertion success rate was similar in these groups. There was no significant hemodynamic changes occurred in these groups during insertion. The leak pressure was higher in both I-GEL and Proseal LMA than the LMA- C. The postoperative complications like sore throat were higher in LMA- C than other 2 devices (European Journal of Anaesthesia 2009 Nov.12).

DETAILS OF STUDY

DETAILS OF STUDY

TITLE OF THE STUDY:

"A COMPARATIVE STUDY OF EASE OF INSERTION, HEMODYNAMIC CHANGES AND POSTOPERATIVE ADVERSE EVENTS OF PROSEAL LARYNGEAL MASK AIRWAY VERSUS I – GEL ''.

AIM OF THE STUDY

The main aim of this study is to compare the two supraglottic airway devices, IGEL with Proseal LMA in clinical performance of elective **short** surgeries with **spontaneous ventilation**.

OBJECTIVES OF THE STUDY

1. To compare the ease of insertion.
2. To compare number of attempts.
3. To compare hemodynamic changes during
   - Insertion,
   - Intraoperative period,
   - Removal.
4. To compare airway trauma, blood staining of device and incidence of complication like bronchospasm, laryngospasm, sore throat, vomiting, regurgitation, hoarseness of voice.

Materials and Methods:

Source of Data:

60 patients admitted in Coimbatore medical college and hospital undergoing elective surgeries. (General surgery and Plastic surgery department)

Study Place:

Coimbatore Medical College and Hospital.

Study Design:

Prospective randomised study.

Sample Size:

60 patients

Study period:

The study period is One year (Aug-2014 – July 2015) after obtaining institutional ethical committee approval.

Inclusion criteria:

- Patient undergoing elective surgeries where spontaneous ventilation is ideal.
- Age 18-50 yrs. of both sexes.

- ASA physical status I & II.

Exclusion Criteria:

- ASA physical status III & IV.
- Emergency surgeries.
- Patients at specific risk of aspiration and anticipated difficult airway.
- History of allergy to latex.
- Mouth opening < 2.5 cm.
- Patient - upper respiratory tract infection.
- Patient with abnormal PFT.

MATERIALS REQUIRED:

- Proseal laryngeal mask airway 3 and 4 size.
- I – GEL LMA 3 and 4 sizes.
- Drugs – Glycopyrolate, Midazolam, Fentanyl, Propofol, Isoflurane, Ranitidine, ondensetron.

OUTCOME OF THE STUDY:

1. **Ease of insertion:**

- Easy or difficult insertion.

- If easy means there is no resistance to insertion in a first attempt.

- If difficult means there is resistance to insertion or more than single attempt need.

2. **Attempts required to insertion.**

- No of attempts required.

- Three times can be attempted and if not possible in three times the procedure abandoned.

3. **Time taken for insertion.**

It is measured by time taken from LMA insertion from oral cavity to proper position to laryngeal inlet.

4. **Hemodynamic changes.**

- Heart rate before insertion, during insertion, intraoperative period, during removal and postoperative period were recorded.

- Systolic, Diastolic and Mean arterial pressure were recorded along with heart rate.

5. **Blood staining of device:**

After patient recovered from the anaesthesia the Proseal LMA or I – GEL will be removed and checked for any blood staining on the device.

6. **Postoperative complications.**

The following complications will be questioned to each patient and any airway adverse events are also noted.

- Laryngospasm, Bronchospasm, cough while removing device, regurgitation and any traumatic injury to airway from oral cavity.
- Sore throat, Hoarseness of voice, throat pain, vomiting and Dysphagia.

All are noted and recorded immediately after removal of device, in recovery room and postoperatively 24 hours.

STUDY PROCEDURE

STUDY PROCEDURE

After taking permission from ethics committee and getting written informed consent from patients, the patients will be allotted randomly into 2 groups of 30 patients. One group will receive Proseal LMA and another group will receive I Gel.

Anaesthesia Protocol:

A thorough pre anaesthetic evaluation was done including history & general examination.

All patients will receive T.Diazepam 5mg and T.Ranitidine 5mg the night before surgery and standard nil per oral protocol followed.

Patients shifted to OT, an IV line was secured with 18g venous cannula, and an infusion of ringer lactate solution was started.

The patients connected to the monitor and the pre induction systolic BP, diastolic BP, MAP, heart rate, SPO2 are recorded.

Inj. Glycopyrolate 0.2mg. Inj.Midazolam 0.04mg/kg. IV, inj. Ondensetron IV will be given as pre medication. Preoxygenation with 100 % O2 for 3 min

Patient induced with Inj.Fentanyl 2 mcg/kg & Propofol 2mg/kg. Intravenously. After an adequate depth of anaesthesia is achieved, Proseal LMA by index finger insertion method or I Gel is inserted and connected to the anaesthetic machine after confirming correct placement.

If the device insertion is not achieved, 2 extra attempts of placing should try. If placements are unsuccessful after 3 attempts, the procedure is discarded and the airway will be secured through other airway device as appropriate and this case will be considered as a failed attempt.

The Proseal LMA was inserted by index finger insertion method. The cuff was inflated with 20 ml of air.

Ventilation will be judged to be optimal with sufficient chest rise, constant oxygenation SPO2 greater than 95% and absence of leak.

I – GEL was inserted in sniffing position. Ventilation will be judged to be optimal with sufficient chest rise, constant oxygenation SPO2 greater than 95% and absence of leak.

Maintenance of anaesthesia done by N2O:O2-66:33%, isoflurane 0.6-1% depending upon the need and depth of anaesthesia for that surgery.

All patients monitored continuously. At the end of procedures, anaesthetic agents will be discontinued; the Proseal LMA (or) I Gel will be removed once the patient fully awake.

The patient shifted to postoperative ward after full recovery.

Parameter evaluated:

- All patients will be monitored continuously for
- Heart rate – during, intraoperative and after insertion.
- SBP, DBP, MAP –during, intraoperative and after insertion.
- SPO2- preoperative, intraoperative, at the end of surgery and after removal of device.

The ease of insertion, number of attempts and duration every try (time from taking the device till attachment it to the airway circuit in seconds).

The leak can be tested by placing the stethoscope over mouth, epigastrium and drain tube end to hear any leak.

Each patient will be questioned to determine the following complications

- Throat pain, sore throat.
- Dysphagia.
- Dysphonia (difficulty (or) pain with speaking).
- Nausea and vomiting.

- Hoarseness of voice.

Complication such as incidence of any airway complication will be evaluated

- Post extubation cough,
- breath holding ,
- Laryngospasm.
- Bronchospasm, regurgitation.
- Presence of blood on the devices
- Lip, oral mucosal, pharynx trauma.

All cases will be questioned to verify any of the complications in postop room & 24 hrs post operatively.

- Sore throat, throat pain
- Nausea, vomiting
- Dysphagia.
- Hoarseness of voice.

Follow up:

Yes

Follow up period:

Patient will be followed up for 24 hrs in post-operative ward.

Statistical analysis:

The data will be analysed using SPSS version for windows 7.

I-GEL: (Figure 16)

I – GEL insertion during surgery

PROSEAL: (Figure 17)

PROSEAL insertion during surgery

OBSERVATION AND RESULTS

OBSERVATION AND RESULTS

This study conducted to evaluate the two airway device Proseal LMA and I – GEL in view of ease of insertion, number of attempts, hemodynamic changes and postoperative adverse events. All data were collected, tabulated and expressed as mean +/- standard deviation. Appropriate statistical analysis was conducted. All quantitative data were compared using chi-square test. P values were calculated for all tests. A p values 0 to 0.01 was considered as 1 % significant, 0.011 to 0.05 was considered 5% significant, and >0.05 was considered as not significant.

TABLE 1:

Age

Group	N	Mean±SD	P Value
IGEL	30	30.40±9.1	.757
PROSEAL	30	31.10±8.8	**Not significant**

Table 1 shows that the mean age group of IGEL is 30.40 and PROSEAL is 31.10 respectively and is not statistically significant ($p>0.05$).

CHART 1:

Age

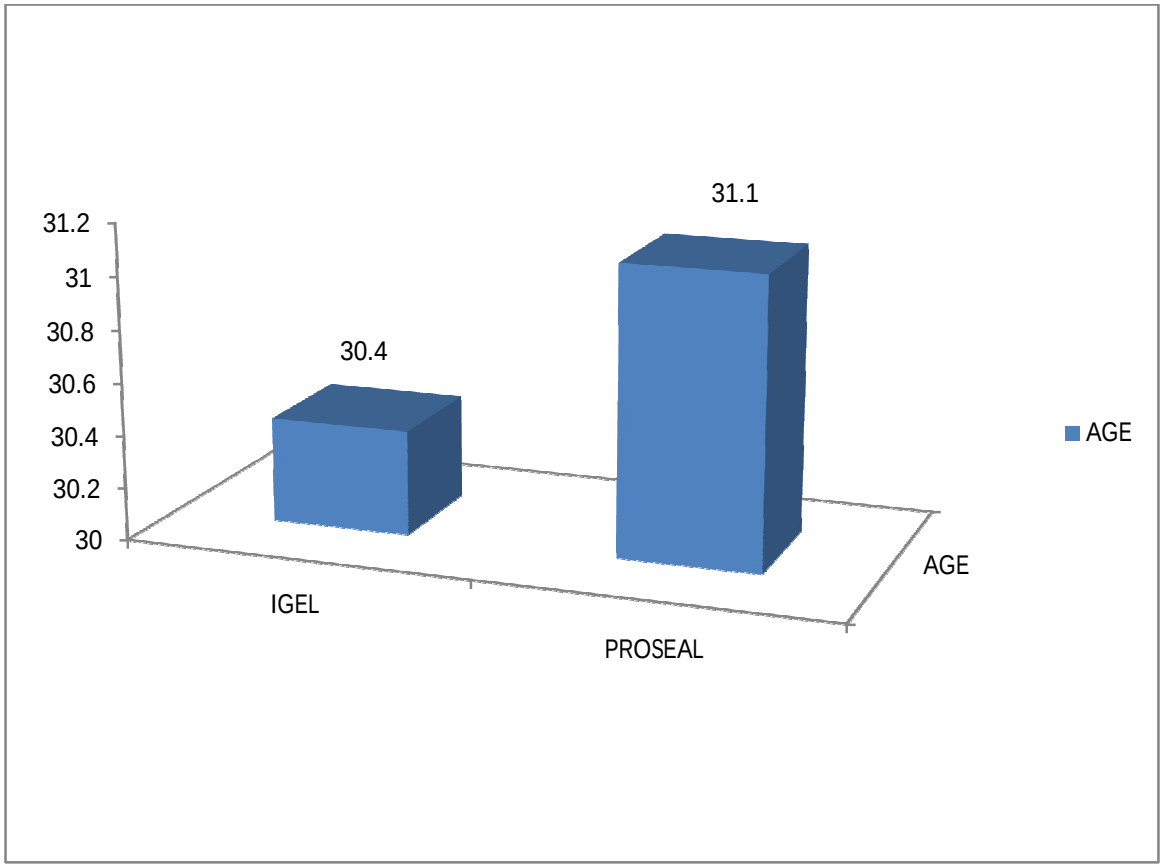


Chart 1 shows that the mean age group of IGEL is 30.40 and PROSEAL is 31.10 respectively and is not statistically significant ($p>0.05$).

TABLE: 2

Demographic details – sex

Group	MALE	FEMALE
I- GEL	16 (53.3%)	14 (46.6%)
PROSEAL	12 (40%)	18 (60%)

TABLE 2 shows in I-GEL group 16 males and 14 females. In Proseal group is12 males and 18 females.

CHART : 2

Demographic Details – Sex

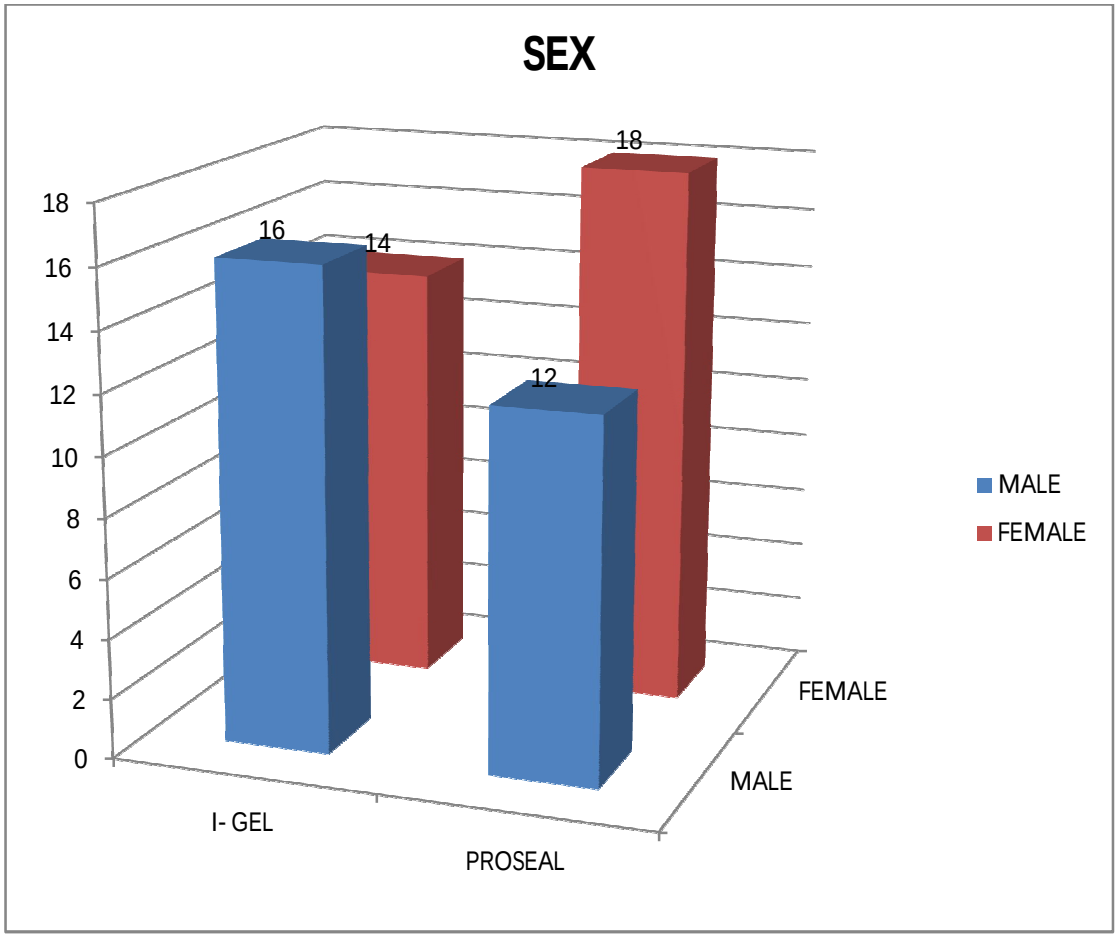


Chart 2 shows in I-GEL group 16 males and 14 females. In Proseal group is12 males and 18 females.

TABLE: 3

Ease of Insertion

Group	Easy	Difficult	P Value
IGEL	27(90.0%)	3(10%)	.02 **significant**
PROSEAL	25(83.3%)	5(16.7%)	

Table 3 shows that by using IGEL 90% of cases were inserted easily and by using PROSEAL 83.3% of cases were inserted easily. Association of IGEL and PROSEAL with ease of insertion was done using CHISQUARE and is statistically significant ($p<0.05$).

CHART : 3

Ease of Insertion

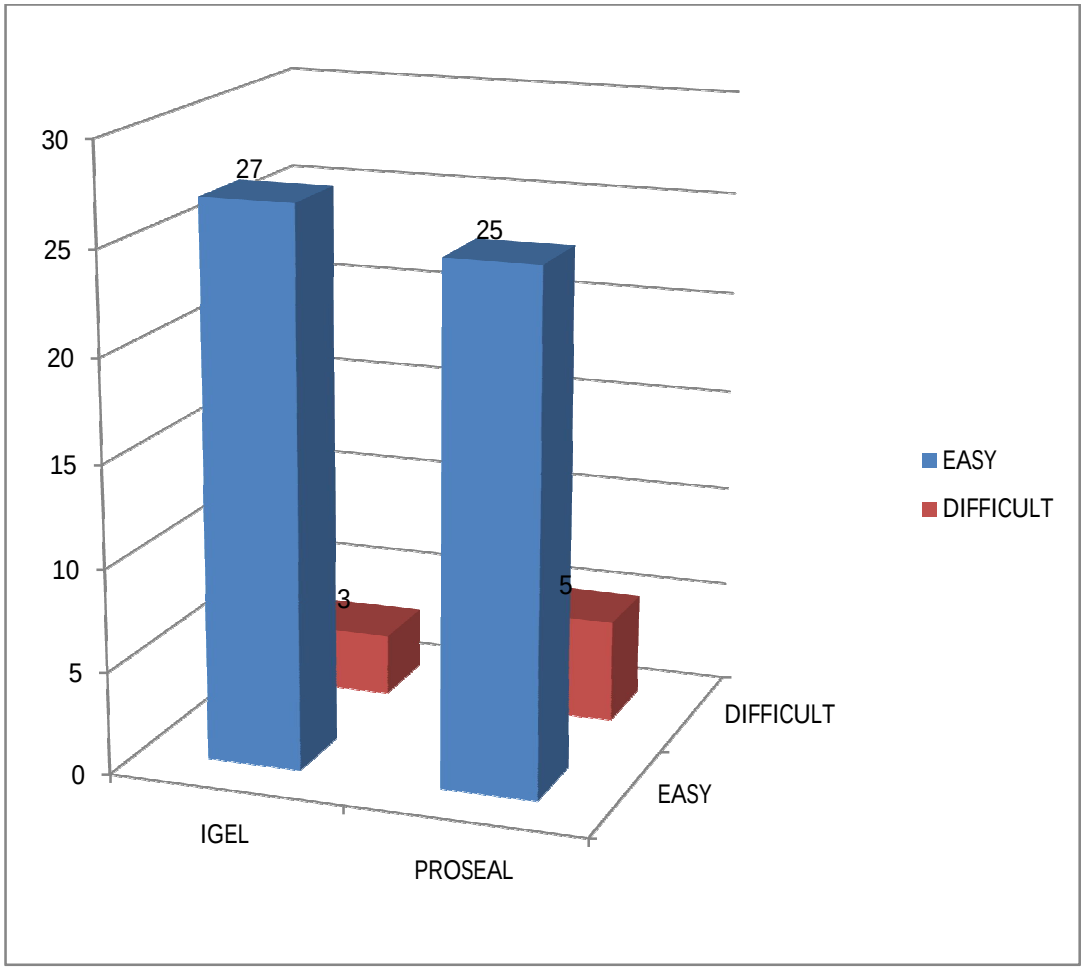


Chart 3 shows that by using IGEL 90% of cases were inserted easily and by using PROSEAL 83.3% of cases were inserted easily. Association of IGEL and PROSEAL with ease of insertion was done using CHISQUARE and is statistically significant ($p<0.05$).

TABLE 4:

No of Attempts

Group	1 attempt	2 attempt	P Value
IGEL	28(93.3%)	2(6.7%)	.228 **Not significant**
PROSEAL	25(83.3%)	5(16.7%)	

Table 4 shows that by using IGEL 93.3% of cases were done in first attempt and by using PROSEAL 83.3% of cases were done in first attempt. Association of IGEL and PROSEAL with number of attempts was done using CHISQUARE and is not statistically not significant ($p>0.05$).

CHART 4:

No of Attempts

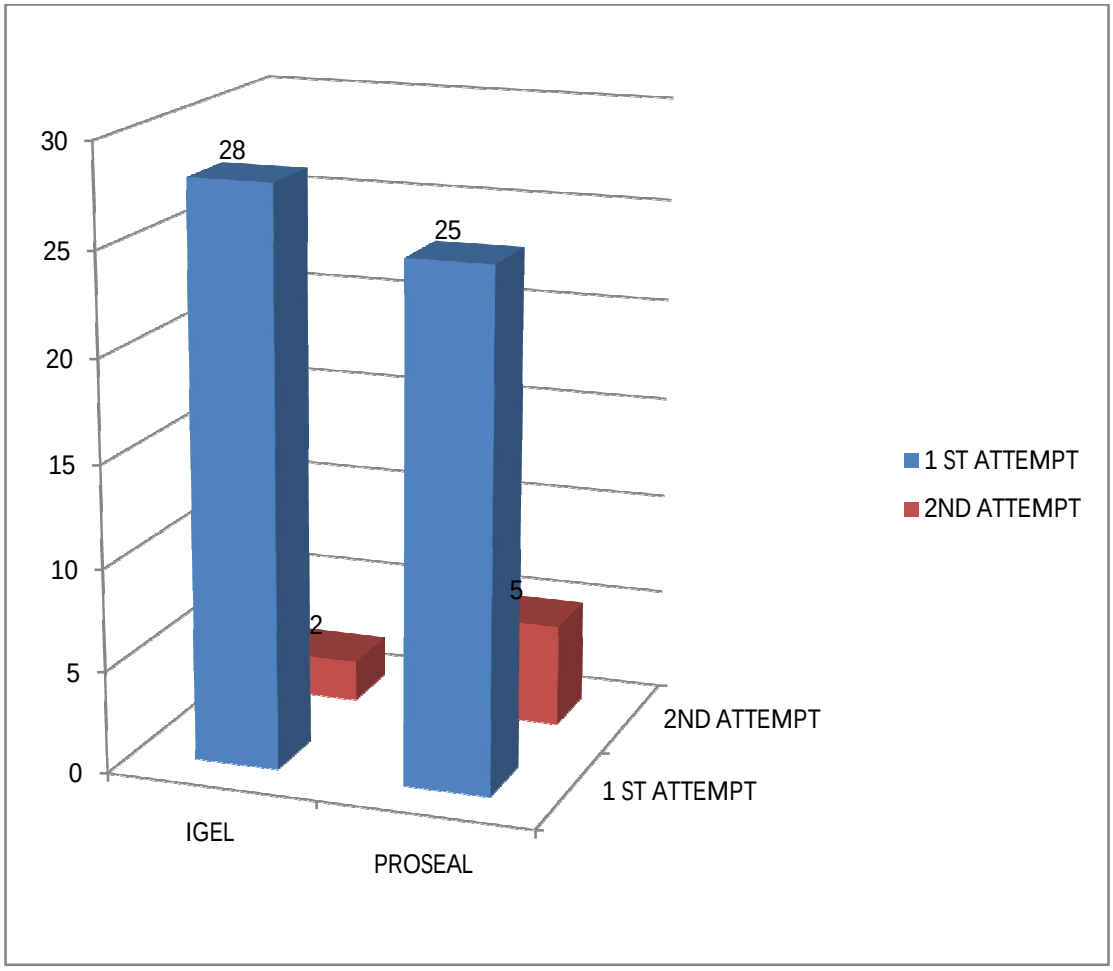


Chart 4 shows that by using IGEL 93.3% of cases were done in first attempt and by using PROSEAL 83.3% of cases were done in first attempt. Association of IGEL and PROSEAL with number of attempts was done using CHISQUARE and is not statistically not significant ($p>0.05$).

TABLE 5:

Duration of Attempts

Group	N	Mean±SD	P Value
IGEL	30	14.57±2.1	.003 **significant**
PROSEAL	30	24.97±4.2	

Table 5 shows that the mean duration of attempts in IGEL is 14.57 and PROSEAL is 24.97 respectively and is statistically significant ($p<0.05$).

CHART 5:

Duration of Attempts

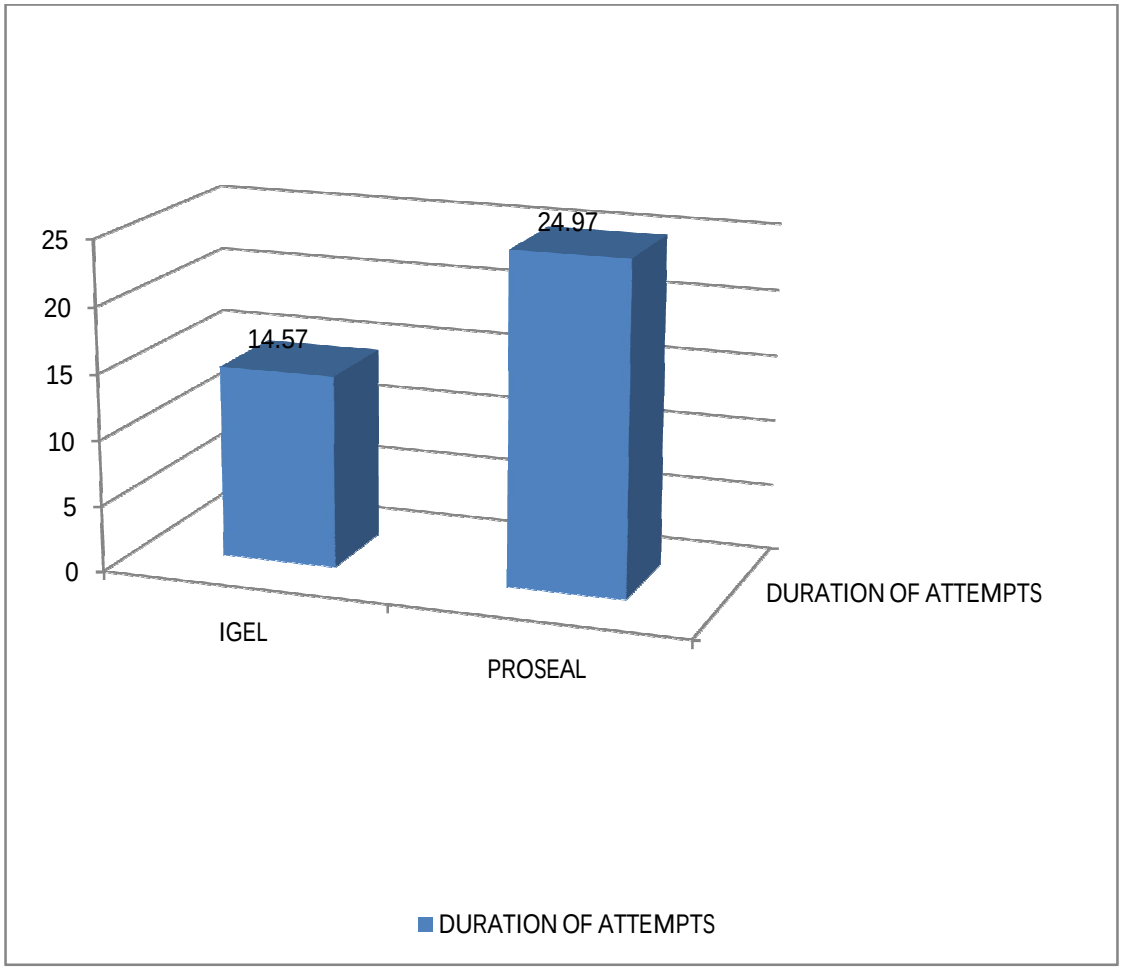


Chart 5 shows that the mean duration of attempts in IGEL is 14.57 and PROSEAL is 24.97 respectively and is statistically significant ($p<0.05$).

TABLE : 6

Blood Staining

Group	Blood staining		P Value
	NO	YES	
IGEL	28(93.3%)	2(6.7%)	.038 **significant**
PROSEAL	22(73.3%)	8(26.7%)	

Table 6 shows that by using IGEL 6.7% of cases had blood staining after removal and by using PROSEAL 26.7% of cases were had blood staining after removal. Association of IGEL and PROSEAL with blood staining in the device was done using CHISQUARE and is statistically significant ($p<0.05$).

CHART : 6

Blood Staining

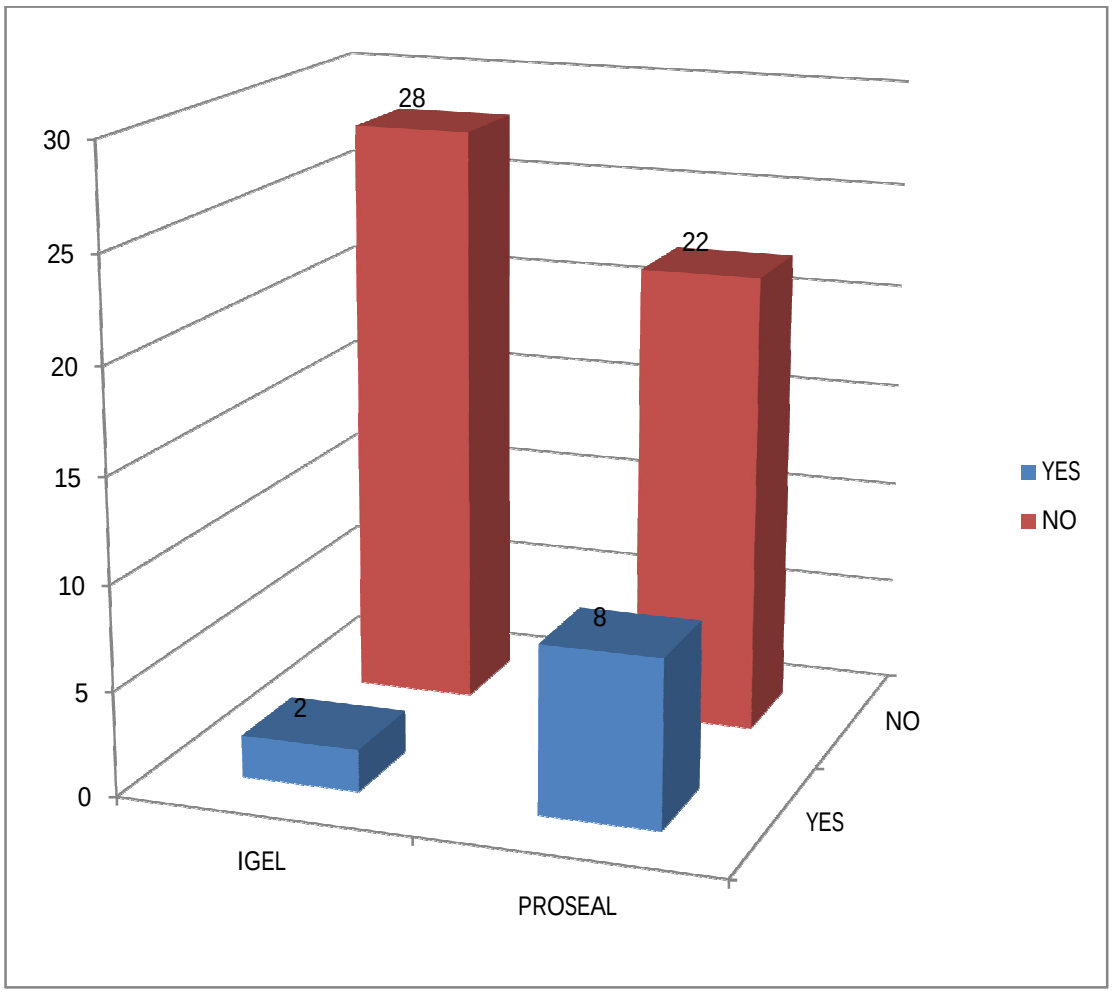


Chart 6 shows that by using IGEL 6.7% of cases had blood staining after removal and by using PROSEAL 26.7% of cases were had blood staining after removal. Association of IGEL and PROSEAL with blood staining in the device was done using CHISQUARE and is statistically significant ($p<0.05$).

TABLE 7:

Complications

COMPLICATIONS	IGEL		PROSEAL		P Value
	YES	NO	YES	NO	
Sore throat	1 (3.3%)	29 (96.7%)	4 (13.3%)	26 (86.7%)	.161 **Not significant**
Bronchospasm	0	30(100%)	0	30(100%)	30(100%)
Larnygospasm	0	30(100%)	0	30(100%)	30(100%)
Traumatic injury	0	30(100%)	0	30(100%)	30(100%)
Hoarseness of voice	0	30(100%)	0	30(100%)	30(100%)

Table 7 shows that by using IGEL 3.3% of cases had complication of sore throat and by using PROSEAL there is 13.3% of cases had complication of sore throat. Association of IGEL and PROSEAL with complication following surgery was done using CHISQUARE and is statistically not significant ($p<0.05$).

CHART 7:

Sore Throat

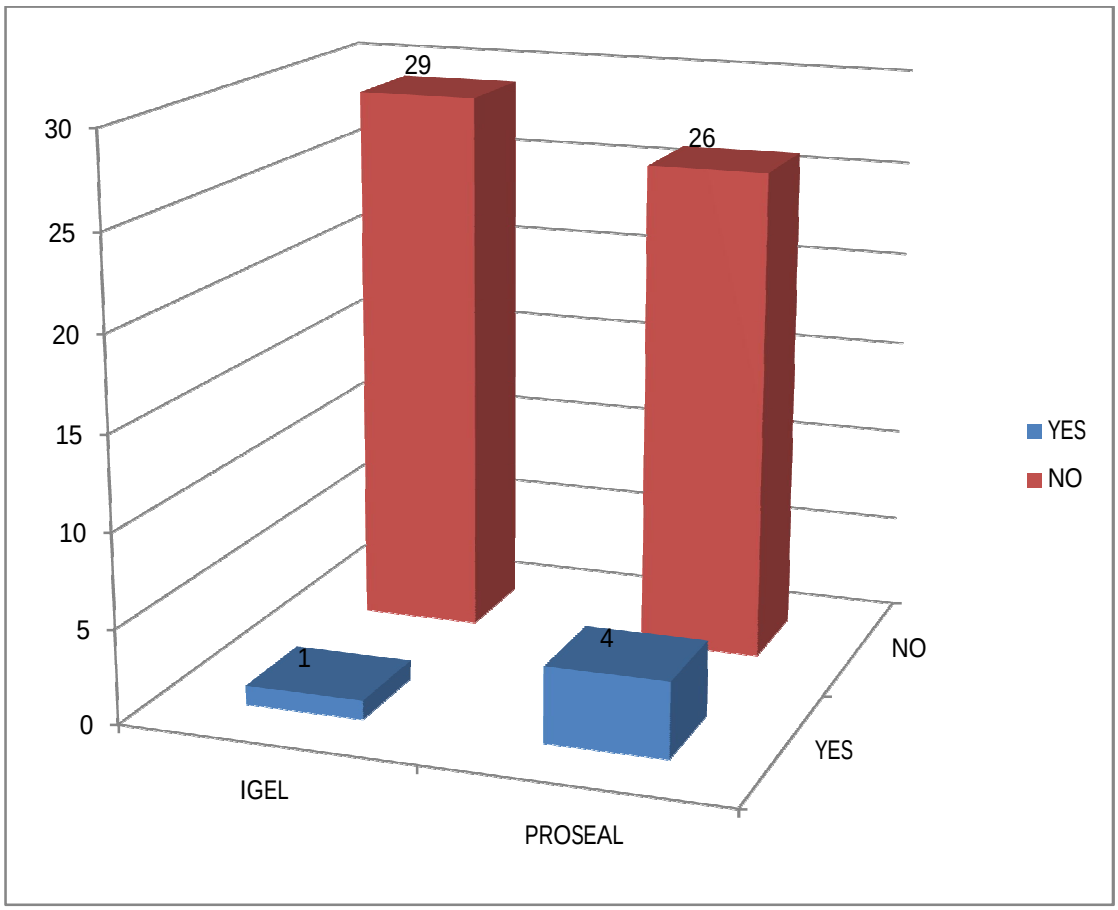


Chart 7 shows that by using IGEL 3.3% of cases had complication of sore throat and by using PROSEAL there is 13.3% of cases had complication of sore throat. Association of IGEL and PROSEAL with complication following surgery was done using CHISQUARE and is statistically not significant ($p<0.05$).

TABLE 8:

Heart Rate

	Group	N	Mean±SD	P Value
Baseline	**IGEL**	30	81.00±10.4	.550 **Not significant**
	PROSEAL	30	84.70±10.8	
Post 1 minute	**IGEL**	30	86.43±11.4	.841 **Not significant**
	PROSEAL	30	90.33±10.6	
Post 5 minute	**IGEL**	30	86.43±10.8	.567 **Not significant**
	PROSEAL	30	91.00±11.3	
Device removal	**IGEL**	30	91.73±11.2	.764 **Not significant**
	PROSEAL	30	94.77±11.4	

Table 8 shows that the mean Heart rate of IGEL during baseline ,post 1 minute, post 5minute , device removal is 81.00,86.43,86.43,91.73 respectively and the mean Heart rate of PROSEAL during baseline ,post 1 minute, post 5minute , device removal is 84.70 , 90.33,91.00, 94.77 respectively and is statistically not significant ($p<0.05$).

CHART 8:

Heart Rate

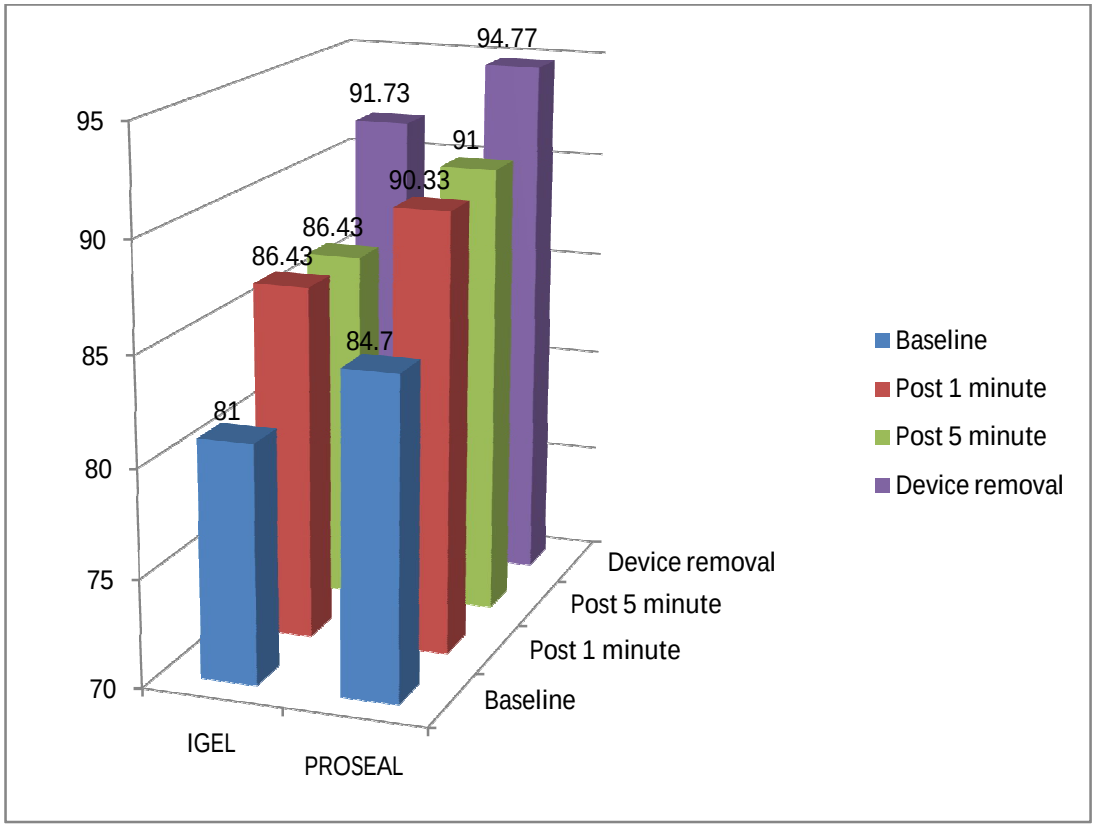


Chart 8 shows that the mean Heart rate of IGEL during baseline ,post 1 minute, post 5minute , device removal is 81.00,86.43,86.43,91.73 respectively and the mean Heart rate of PROSEAL during baseline ,post 1 minute, post 5minute , device removal is 84.70 , 90.33,91.00, 94.77 respectively and is statistically not significant ($p<0.05$).

TABLE 9:

Systolic Blood Pressure

	Group	N	Mean±SD	P Value
Baseline	**IGEL**	30	117.13±8.6	.707
	PROSEAL	30	117.73±8.7	**Not significant**
1 minute	**IGEL**	30	123.33±9.3	.101
	PROSEAL	30	124.17±6.4	**Not significant**
5 minute	**IGEL**	30	126.73±6.7	.081
	PROSEAL	30	127.57±4.0	**Not significant**
Device removal	**IGEL**	30	131.97±6.0	.751
	PROSEAL	30	132.30±4.1	**Not significant**

Table 9 shows that the mean systolic blood pressure of IGEL during baseline , post 1 minute, post 5minute , device removal is 117.13,123.33,126.73,131.97 respectively and the systolic blood pressure of PROSEAL during baseline ,post 1 minute, post 5minute , device removal is 117.73,124.17,127.57,132.30 respectively and is not statistically significant in ($p>0.05$).

CHART 9:

Systolic Blood Pressure

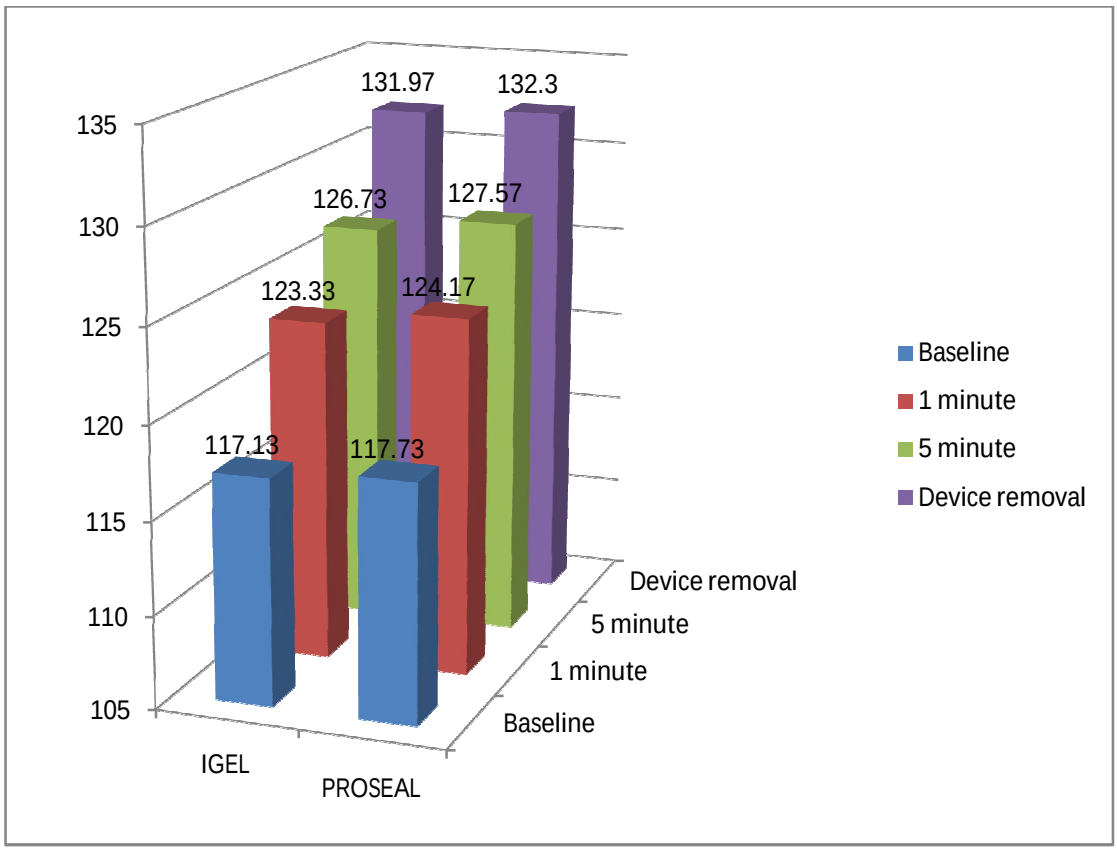


Chart 9 shows that the mean systolic blood pressure of IGEL during baseline , post 1 minute, post 5minute , device removal is 117.13,123.33,126.73,131.97 respectively and the systolic blood pressure of PROSEAL during baseline ,post 1 minute, post 5minute , device removal is 117.73,124.17,127.57,132.30 respectively and is not statistically significant in ($p>0.05$).

TABLE 10:

Diastolic Blood Pressure

	Group	N	Mean±SD	P Value
Baseline	**IGEL**	30	78.87±6.4	.305 **Not significant**
	PROSEAL	30	76.43±5.2	
1 minute	**IGEL**	30	82.53±7.7	.064 **Not significant**
	PROSEAL	30	81.02±5.1	
5 minute	**IGEL**	30	80.07±8.6	.074 **Not significant**
	PROSEAL	30	82.77±4.2	
Device removal	**IGEL**	30	83.60±8.3	.072 **Not significant**
	PROSEAL	30	86.93±5.9	

Table 10 shows that the mean diastolic blood pressure of IGEL during baseline ,post 1 minute, post 5minute ,device removal is 78.87,82.53,80.07,83.60 respectively and the diastolic blood pressure of PROSEAL during baseline ,post 1 minute, post 5minute ,device removal is 76.46,82.02,83.77,86.93 respectively and is not statistically significant in ($p>0.05$).

CHART 10:

Diastolic Blood Pressure

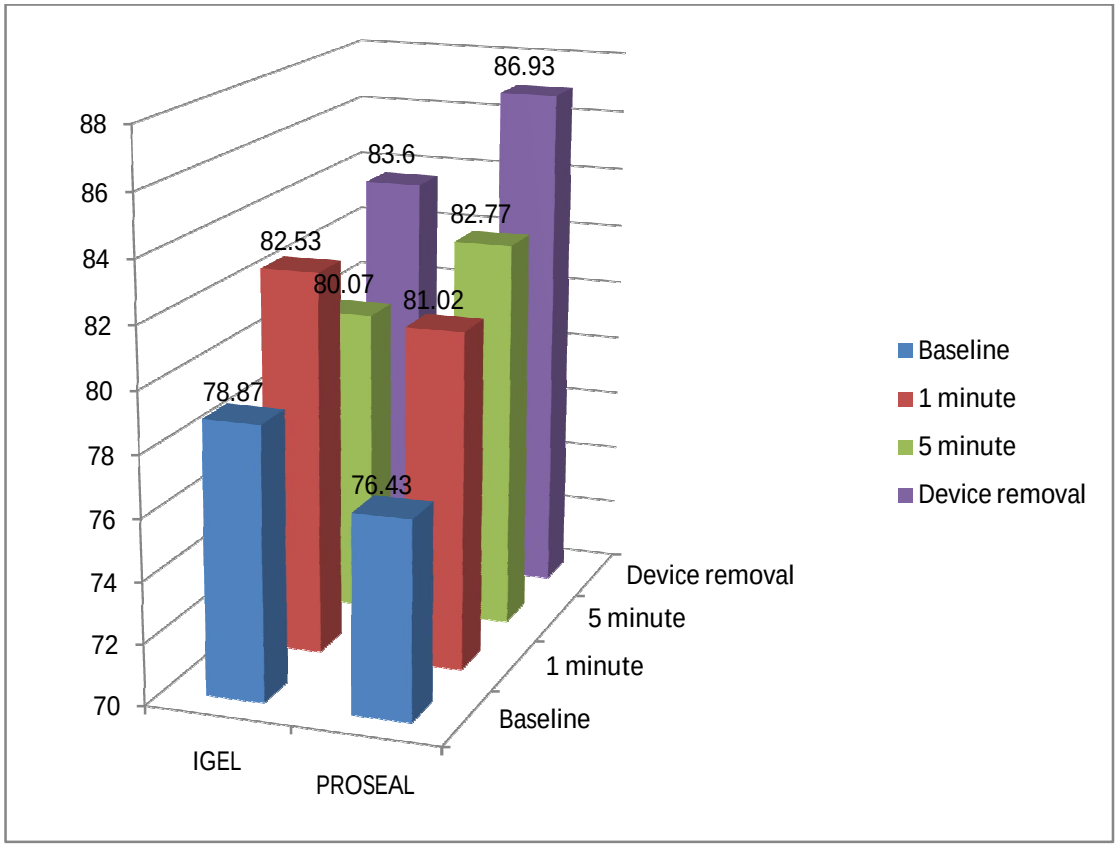


Chart 10 shows that the mean diastolic blood pressure of IGEL during baseline ,post 1 minute, post 5minute ,device removal is 78.87,82.53,80.07,83.60 respectively and the diastolic blood pressure of PROSEAL during baseline ,post 1 minute, post 5minute ,device removal is 76.46,82.02,83.77,86.93 respectively and is not statistically significant in ($p>0.05$).

TABLE11:

Mean blood pressure

	Group	N	Mean±SD	P Value
Baseline	**IGEL**	30	91.47±5.8	.180 **Not significant**
	PROSEAL	30	90.17±4.6	
1 minute	**IGEL**	30	95.87±7.6	.078 **Not significant**
	PROSEAL	30	97.03±3.8	
5 minute	**IGEL**	30	95.23±6.8	.083 **Not significant**
	PROSEAL	30	96.40±3.3	
Device removal	**IGEL**	30	99.43±6.5	.121 **Not significant**
	PROSEAL	30	102.10±4.2	

Table 11 shows that the mean blood pressure of IGEL during baseline ,post 1 minute, post 5minute ,device removal is 91.47,95.87,95.23,99.43 respectively and the mean blood pressure of PROSEAL during baseline ,post 1 minute, post 5minute ,device removal is 90.17,97.03,96.40,102.10 respectively and is not statistically significant in ($p>0.05$).

CHART 11:

Mean Blood Pressure

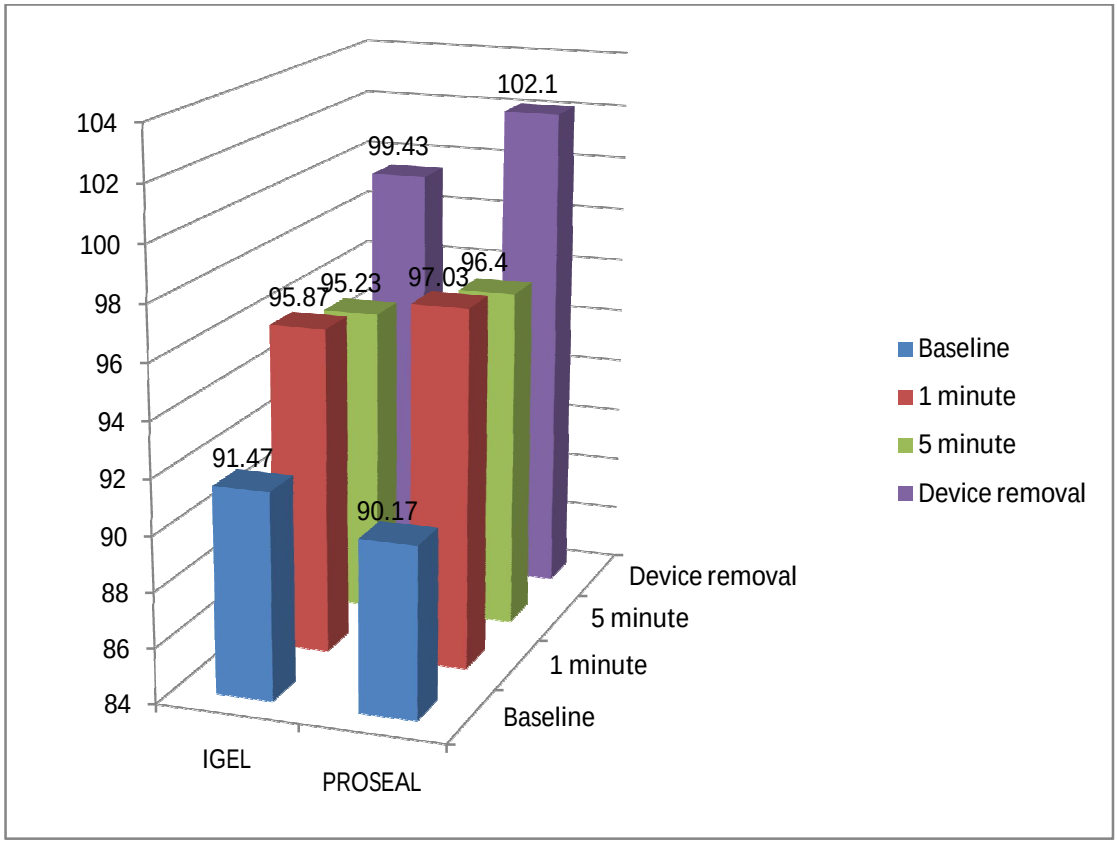


Chart 11 shows that the mean blood pressure of IGEL during baseline ,post 1 minute, post 5minute ,device removal is 91.47,95.87,95.23,99.43 respectively and the mean blood pressure of PROSEAL during baseline ,post 1 minute, post 5minute ,device removal is 90.17,97.03,96.40,102.10 respectively and is not statistically significant in ($p>0.05$).

DISCUSSION

DISCUSSION

The study conducted to evaluate the two airway device Proseal LMA and I – GEL in view of ease of insertion, number of attempts, hemodynamic changes and postoperative adverse events. The study was conducted to 60 patients of both sexes aged 18 – 50 years going for elective surgical procedures with spontaneous ventilation. Both the devices provide patent airway during PPV. Both devices also reduce the incidence of gastric insufflations and regurgitation.

The above study shows that the mean age group of IGEL is 30.40 and Proseal is 31.10 respectively and is not statistically significant (P> 0.05).

The ease of insertion of I-GEL was easy for 90% of cases (27) and 10% (3) of cases had difficult insertion. The Proseal shows 83.3% cases (25) had easy insertion and 16.7% of cases (5) had difficulty in insertion. This is statistically significant in p value of < 0.05. The study conducted by Ishwer singh and the Monika Gupta[22] shows in view of ease of insertion for I-GEL was better than PLMA.

I-GEL shows 93.3% cases (28) had success in first attempt and 6.7% of cases (2) had success in second attempt. The Proseal had 83.3% of cases (25) success in first attempt and 16.7% of cases (5) had success in second attempt. This is statistically not significant has p value of > 0.05. The study conducted by Ishwer singh and the Monika Gupta[22] shows the number of attempts was better for I-GEL than PLMA.

In duration of attempts I- GEL had a mean duration of 14.57 with standard deviation of 2.1. The Proseal had a mean duration of attempt shows 24.97 with standard deviation of 4.2. So in duration of attempts of I-GEL versus Proseal LMA was statistically significant has p value of < 0.05. Therefore, in view of duration attempts the I-GEL was better than Proseal. The study conducted by Gatward & T.M. Cook shows the duration of attempts was less for I-GEL.

I-GEL had 6.7% of cases (2) with blood staining in device after removal and 93.3% of cases (28) had no blood staining in device after removal. Proseal had 26.7% of cases (8) with blood staining in device after removal and 73.3% of cases (22) had no blood staining in device after removal. This shows statistically significant in blood staining of device after removal with p value of < 0.05. So I- GEL was less blood staining in device than Proseal.

In complication wise I- GEL had one case (3.3%) of sore throat and Proseal had 4 cases (13.3%) of sore throat. This is statistically not significant has p value of > 0.05.

Other complications like bronchospasm, laryngospasm, traumatic injury, vomiting and hoarseness of voice did not occur in two groups. Association of IGEL and PROSEAL with complication following surgery was done using CHISQUARE and is statistically not significant ($p<0.05$).

Above study shows in hemodynamic changes during insertion, intraopeartive period and removal both groups had same changes no difference in data wise. So the Heart rate, Systolic blood pressure, Diastolic blood pressure and Mean arterial pressure in both groups have no statistically significant with p value of > 0.05.

SUMMARY

SUMMARY

"**A COMPARATIVE STUDY OF EASE OF INSERTION , HEMODYNAMIC CHANGES AND POSTOPERATIVE ADVERSE EVENTS OF PROSEAL LARYNGEAL MASK AIRWAY VERSUS I – GEL**'' a prospective study, conducted on 60 patients posted for elective short surgical procedures with spontaneous ventilation. With above study following conclusion was made.

- Between the two groups there is no demographic difference.
- When compared to Proseal LMA the ease of insertion for I – GEL was easier.
- When compared to Proseal LMA the attempts required to insertion was less for I – GEL. But it was not statistically significant.
- When compared to Proseal LMA the time required to insertion of I – GEL was less in duration.
- Between the two groups, there are no statistically significant Hemodynamic changes.

- When compared to Proseal LMA the blood staining of device was less in I – GEL. So the traumatic injury to the airway was less in I – GEL than Proseal LMA.

- In postoperative adverse events sore throat seen in Proseal group.

- Postoperative complication like laryngospasm, cough, regurgitation, dysphagia, vomiting and hoarseness of voice did not occur in both Proseal LMA and I – GEL groups.

CONCLUSION

CONCLUSION

The study was conducted to evaluate the clinical utilization of the two airway device Proseal LMA and I – GEL in elective surgical procedures. With the above study I –GEL was better in view of ease of insertion, placement was rapid and also less traumatic to airways than Proseal LMA. So I- GEL is a cheap and effective SGD alternative to Proseal LMA.

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PROFORMA

PROFORMA

Proseal LMA or I – GEL group:

Name:

Age:

Sex:

Ip no:

Diagnosis:

Procedure:

Pre operative assessment:

History:

- H/O Past illness

General examination:

- Pulse rate:
- BP:
- CVS:
- RS:

Airway examination:

- Mallampatti classification:
- Neck movements:
- Dentures:

- Inter incisor distance:
- Thyro mental distance:

Parameters observed:

- Ease of insertion : Easy or Difficult.
- No of insertion attempts.
- Time taken for insertion.
- Haemodynamic changes.

	BASELINE			POST INSERTION								
				1 MIN			5 MIN			DEVICE REMOVAL		
	SYS	DIA	MAP	SYS	DIA	MAP	SYS	DIA	MAP	SYS	DIA	MAP
BLOOD PRESSURE												
HEART RATE												

- Blood staining of device: Yes or No
- Postoperative complications:

Laryngospasm:

Bronchospasm:

Cough:

Sorethroat:

Regurgitation:

Hoarseness of voice:

Traumatic injury:

PATIENT CONSENT FORM

INFORMED CONSENT FORM

I am Dr. K.Arulanandan, carrying out a study on the topic **"A COMPARATIVE STUDY OF EASE OF INSERTION, HEMODYNAMIC CHANGES AND POSTOPERATIVE ADVERSE EVENTS OF PROSEAL LARYNGEAL MASK AIRWAY VERSUS I GEL",**

My research project is being carried out under the department of Anaesthesiology, Coimbatore Medical College and Government hospital.

RESEARCH BEING DONE:

"A comparative study of ease of insertion,hemodynamic changes and postoperative adverse events of Proseal laryngeal mask airway versus I gel".

SAMPLE SIZE:

60 patients.

STUDY PARTICIPANTS:

Adults aged 18-50 years with ASA physical status I and II for elective surgery.

LOCATION:

CMCH, Coimbatore.

PROCEDURES INVOLVED:

The research includes detailed clinical examination including medical history, physical examination. After the initial examination, patients will be randomly allocated into either group Proseal LMA or I-GEL.

You, Shri./ Smt./ Kum. _____, aged ____ years, S/o / D/o / W/o _____, residing at _____ _____ are requested to be a participant in the research study **titled "A COMPARATIVE STUDY OF EASE OF INSERTION, HEMODYNAMIC CHANGES AND POSTOPERATIVE ADVERSE EVENTS OF PROSEAL LARYNGEAL MASK AIRWAY VERSUS I GEL".** in Government Medical College Hospital, Coimbatore. You satisfy eligibility criteria as per the inclusion criteria. You can ask any question or seek any clarifications on the study that you may have before agreeing to participate.

DECLINE FROM PARTICIPATION

You are hereby made aware that participation in this study is purely voluntary and honorary and that you have the option and the right to decline from participation in the study.

PRIVACY AND CONFIDENTIALITY

You are hereby assured about your privacy. Privacy of subject will be respected and any information about you or provided by you during the study will be kept strictly confidential.

AUTHORIZATION TO PUBLISH RESULTS

Results of the study may be published for scientific purposes and/or presented to scientific groups, however you will not be identified; neither will your privacy be breached.

STATEMENT OF CONSENT

I, _____, do hereby volunteer and consent to participate in this study being conducted by Dr. K.Arulanandan. I have read and understood the consent form / or it has been read and explained to me in my own language. The study has been fully explained to me, and I may ask questions at any time.

Signature / Left Thumb Impression of the Volunteer Date:

Place:

Signature and Name of witness Date:

Place:

Signature of the investigator:

Name of the investigator:

xggpjy;gotk;

bgah; :

taJ :

ghypdk; :

Kfthp :

muR nfhit kUj;Jtf; fy;Yhhpapy; kaf;f kUe;jtpay; kUj;Jt Jiwapy; gl;l nkwgoggpg[gapYk; khzth; **jpU. f. mUshde;jd;** mth;fs; nkwbfhs;Sk; ,uz;L kaf;f kUe;J **rhjd';fshdgpuhrpy; byhpdrrpay; kh!f;Vhpnt kwWk; lb$y; byhpdrrpay;kh!f;Vhpnt xggpLjy;** gwwpa Ma;tpy;bra;Kiwkw;Wk; midj;J tpsf;f';fisapk; nfl;Lf; bfhz;L vdJ renjf';fis bjhptpgLj;jpf;bfhz;ld;vdgij bjhptpj;Jf;bfhs;fpnwd;

ehd; ,e;j Ma;tpy; KG rkkjj;JlDk/ Ra re;jida[lDk; fye;J bfhs;s rkkjpf;fpnwd;

,e;j Ma;tpy;vd;id gwwpa midj;J tpgu';fs;ghJfhf;fg; gLtJld;,jd;Kotpfs;Ma;tpjHpy;btspaplggLtjpy;Mlnrgiz ,y;iy vdgij bjhptpj;Jf; bfhs;fpnwd; ve;j neuj;jpYk; ,e;j Ma;tpy; ,Ue;J ehd; tpyfpf; bfhs;s vdf;F chpik czL vdgijapk;mwpntd;

,lk;

njjp

ifbahggk;/ nuif

MASTER CHART

MASTER CHART I-GEL																																
S. No	Name	Age / sex	IP NO	Device	EOI	NOA	TTI (SEC)	Heart rate				BLOOD PRESSURE												BS	COMPLICATION								
												BASELINE			POST INSRTION																	
															After 1 min			After 5 min			DR										
								BL	Post 1 min	Post 5 min	DR	SYS	DIA	MAP	SYS	DIA	MAP	SYS	DIA	MAP	SYS	DIA	MAP		RG	ST	BS	LS	TI	CH	VG	HOV
1	FATHIMA	19/F	44606	IGEL	E	1	12	74	80	81	85	118	72	87	126	80	95	129	80	96	134	81	98	NO	NO	NO	NO	NO	NO	NO	NO	NO
2	SENBAGAM	23/F	45172	IGEL	E	1	15	90	95	95	99	115	77	89	120	84	96	121	82	95	129	80	96	NO	NO	NO	NO	NO	NO	NO	NO	NO
3	AYISHA	38/F	45546	IGEL	E	1	13	67	72	74	76	109	82	91	115	80	92	122	77	92	128	79	95	NO	NO	NO	NO	NO	NO	NO	NO	NO
4	ROOBA	26/F	45587	IGEL	E	1	15	88	90	92	101	110	92	98	119	91	100	123	86	98	127	85	99	NO	NO	NO	NO	NO	NO	NO	NO	NO
5	JEGAJOTHI	43/F	51164	IGEL	E	1	11	75	72	74	80	115	79	91	128	76	93	125	80	95	129	84	99	NO	NO	NO	NO	NO	NO	NO	NO	NO
6	PALAVATHAL	45/F	48640	IGEL	E	1	14	81	83	86	90	108	80	89	118	85	96	127	85	99	131	90	103	NO	NO	NO	NO	NO	NO	NO	NO	NO
7	NANDHINIPRIYA	18/F	52721	IGEL	E	1	13	78	83	85	91	103	88	93	120	88	99	123	82	95	130	86	100	NO	NO	NO	NO	NO	NO	NO	NO	NO
8	SATHYAVANI	20/F	52891	IGEL	E	1	15	69	73	75	78	120	81	94	134	89	104	131	81	97	136	83	100	NO	NO	YES	NO	NO	NO	NO	NO	NO
9	SIVASHANKARI	20/F	53156	IGEL	E	1	14	77	80	80	84	122	71	88	129	83	98	134	79	97	136	81	99	NO	NO	NO	NO	NO	NO	NO	NO	NO
10	SAROJA	33/F	53382	IGEL	E	1	12	92	105	110	114	116	87	96	126	97	107	129	90	102	133	94	107	NO	NO	NO	NO	NO	NO	NO	NO	NO
11	SUNITHA	36/F	57888	IGEL	E	1	19	83	88	90	94	120	83	95	123	90	101	130	83	98	136	88	104	NO	NO	NO	NO	NO	NO	NO	NO	NO
12	YASMIN	30/F	57897	IGEL	D	2	17	100	109	103	109	116	67	83	125	75	92	131	70	90	138	72	94	YES	NO	NO	NO	NO	NO	NO	NO	NO
13	AJUMNISHA	40/F	58788	IGEL	E	1	11	62	68	64	69	109	69	82	114	70	85	122	65	84	129	69	89	NO	NO	NO	NO	NO	NO	NO	NO	NO
14	ANITHA	18/F	61567	IGEL	E	1	14	70	76	76	81	104	70	81	110	70	83	119	67	84	125	71	89	NO	NO	NO	NO	NO	NO	NO	NO	NO
15	ANBANANTHAM	30/M	61856	IGEL	E	1	20	69	73	72	78	106	74	85	110	72	85	117	78	91	126	83	97	YES	NO	NO	NO	NO	NO	NO	NO	NO
16	RATHINAKUMAR	27/M	63018	IGEL	E	1	16	82	85	88	92	123	71	88	120	77	91	126	73	90	131	77	95	NO	NO	NO	NO	NO	NO	NO	NO	NO
17	KUMAR	25/M	68966	IGEL	E	1	14	86	96	95	98	114	77	89	122	79	93	129	71	90	136	75	95	NO	NO	NO	NO	NO	NO	NO	NO	NO
18	BALAKRISHNAN	34/M	74571	IGEL	E	1	15	92	97	91	99	118	73	88	129	80	96	124	85	98	132	90	104	NO	NO	NO	NO	NO	NO	NO	NO	NO
19	BALAKRISHNAN	38/M	49918	IGEL	E	1	18	92	100	104	110	121	82	95	130	85	100	127	75	92	134	81	98	NO	NO	NO	NO	NO	NO	NO	NO	NO
20	DHANRAJ	44/M	23779	IGEL	E	1	16	60	67	72	77	132	81	98	130	83	99	131	80	97	138	87	104	NO	NO	NO	NO	NO	NO	NO	NO	NO
21	KULANDAIVEL	45/M	23979	IGEL	D	2	14	82	90	89	94	123	84	97	128	91	103	137	98	110	141	100	113	NO	NO	NO	NO	NO	NO	NO	NO	NO
22	KARUPUSAMY	19/M	39639	IGEL	E	1	15	101	106	98	104	121	80	94	124	88	100	115	77	89	123	80	94	NO	NO	NO	NO	NO	NO	NO	NO	NO
23	GOVIDARAJ	29/M	39678	IGEL	E	1	13	72	78	79	83	112	74	86	100	64	73	111	60	76	116	66	82	NO	NO	NO	NO	NO	NO	NO	NO	NO
24	RAFIK ALI	30/M	39701	IGEL	E	1	15	80	85	81	88	140	88	105	140	92	108	137	88	104	142	92	108	NO	NO	NO	NO	NO	NO	NO	NO	NO
25	MANIKANDASAMY	22/M	38933	IGEL	E	1	12	93	99	96	102	116	80	92	120	86	97	133	86	101	135	90	105	NO	NO	NO	NO	NO	NO	NO	NO	NO
26	KRISHNAN	45/M	37323	IGEL	D	1	15	88	95	94	100	110	82	91	106	80	88	121	92	101	127	96	106	NO	NO	NO	NO	NO	NO	NO	NO	NO
27	VIJAY	21/M	37774	IGEL	E	1	13	76	81	83	89	112	74	86	130	90	103	124	87	99	124	90	101	NO	NO	NO	NO	NO	NO	NO	NO	NO
28	SAKTHIVEL	40/M	34281	IGEL	E	1	15	83	87	85	91	120	84	96	136	92	105	131	94	106	136	97	110	NO	NO	NO	NO	NO	NO	NO	NO	NO
29	RAHULKUMAR	24/M	35972	IGEL	E	1	14	79	86	84	92	135	88	104	138	82	99	141	72	95	143	78	99	NO	NO	NO	NO	NO	NO	NO	NO	NO
30	RAFIKALI	30/M	39701	IGEL	E	1	17	89	94	97	104	126	76	93	130	77	95	130	79	96	134	83	100	NO	NO	NO	NO	NO	NO	NO	NO	NO

MASTER CHART PROSEAL LMA

S. No	Name	Age / sex	IP NO	Device	EOI	NOA	TTI (SEC)	Heart rate				BLOOD PRESSURE												BS	COMPLICATION							
								BL	Post 1 min	Post 5 min	DR	BASELINE			POST INSRTION										RG	ST	BS	LS	TI	CH	VG	HOV
															After 1 min			After 5 min			DR											
												SYS	DIA	MAP	SYS	DIA	MAP	SYS	DIA	MAP	SYS	DIA	MAP										
1	JENITHA	20/F	41630	PROSEAL	E	1	20	88	92	94	96	132	80	97	130	80	95	127	79	94	131	82	98	NO	NO	NO	NO	NO	NO	NO	NO	NO
2	RANGASAMY	45/M	40145	PROSEAL	E	1	19	67	73	70	74	112	77	89	127	82	95	130	82	97	133	85	101	NO	NO	NO	NO	NO	NO	NO	NO	NO
3	REVATHY	20/F	46623	PROSEAL	E	1	15	78	81	82	85	123	72	89	130	78	94	128	71	89	134	70	91	NO	NO	NO	NO	NO	NO	NO	NO	NO
4	GEETHALAKSHMI	30/M	48330	PROSEAL	D	2	25	89	93	95	100	126	74	91	129	82	96	132	78	95	136	80	99	YES	NO	NO	NO	NO	NO	NO	NO	NO
5	MAHESWARI	28/F	51158	PROSEAL	E	1	30	93	97	100	102	120	72	88	126	90	100	130	89	101	137	90	106	NO	NO	NO	NO	NO	NO	NO	NO	NO
6	AMSAVENI	20/F	39503	PROSEAL	E	1	28	97	103	102	103	108	69	82	119	75	88	126	78	93	130	77	95	NO	NO	YES	NO	NO	NO	NO	NO	NO
7	RAMYA	19/F	42430	PROSEAL	E	1	25	100	107	110	114	102	71	81	115	79	89	124	80	93	128	84	99	YES	NO	NO	NO	NO	NO	NO	NO	NO
8	AMRITHA	35/F	52705	PROSEAL	E	1	22	74	81	83	88	118	82	94	124	88	98	130	83	97	133	80	98	NO	NO	NO	NO	NO	NO	NO	NO	NO
9	OMANA	36/F	54034	PROSEAL	E	1	32	72	80	79	77	105	70	82	118	77	89	122	79	92	129	85	100	NO	NO	NO	NO	NO	NO	NO	NO	NO
10	KUMARAN	48/F	54298	PROSEAL	D	2	30	84	88	91	94	107	80	89	120	88	97	128	83	97	132	87	102	YES	NO	NO	NO	NO	NO	NO	NO	NO
11	SUNDARI	29/F	54531	PROSEAL	E	1	25	80	86	87	90	116	83	94	121	91	101	120	81	93	127	83	98	NO	NO	YES	NO	NO	NO	NO	NO	NO
12	SAMSATH BANU	27/F	55672	PROSEAL	E	1	20	99	105	103	106	118	74	89	124	85	96	132	87	101	138	90	106	NO	NO	NO	NO	NO	NO	NO	NO	NO
13	KAVITHADEVI	19/F	57036	PROSEAL	E	1	25	70	77	76	79	121	71	88	128	80	94	126	81	95	130	85	100	NO	NO	NO	NO	NO	NO	NO	NO	NO
14	GEETHAMANI	28/F	57051	PROSEAL	D	2	24	82	88	85	90	132	72	92	137	81	98	131	85	98	138	87	104	YES	NO	NO	NO	NO	NO	NO	NO	NO
15	PONMANI	25/F	60563	PROSEAL	E	1	27	73	79	82	85	124	78	93	130	82	96	133	84	99	137	90	106	NO	NO	NO	NO	NO	NO	NO	NO	NO
16	VELLINGRI	42/M	60537	PROSEAL	D	2	20	102	106	105	110	118	75	89	127	83	96	129	86	99	135	92	106	YES	NO	NO	NO	NO	NO	NO	NO	NO
17	ANTONY	45/M	63197	PROSEAL	E	1	24	79	84	85	89	114	80	91	120	86	96	127	89	100	130	93	105	NO	NO	NO	NO	NO	NO	NO	NO	NO
18	AMUTHA	22/F	62860	PROSEAL	E	1	29	95	100	102	107	106	82	89	110	89	94	121	90	99	126	95	105	NO	NO	NO	NO	NO	NO	NO	NO	NO
19	VIJAYA	25/F	63931	PROSEAL	E	1	30	91	97	99	104	124	88	100	128	92	102	131	85	99	137	91	106	NO	NO	NO	NO	NO	NO	NO	NO	NO
20	JEYAMANI	33/F	65335	PROSEAL	E	1	25	89	94	97	100	126	75	92	130	81	96	130	83	97	135	85	102	YES	NO	NO	NO	NO	NO	NO	NO	NO
21	SUBRAMANI	34/M	65604	PROSEAL	D	2	28	82	89	90	95	119	70	86	126	78	92	127	82	96	130	88	102	YES	NO	NO	NO	NO	NO	NO	NO	NO
22	PREMA	35/F	70393	PROSEAL	E	1	22	77	83	80	84	118	76	90	120	80	92	126	83	96	129	90	103	NO	NO	YES	NO	NO	NO	NO	NO	NO
23	SUBRAMANI	45/M	73573	PROSEAL	E	1	20	75	79	82	90	115	81	92	121	85	95	128	88	100	131	90	104	NO	NO	NO	NO	NO	NO	NO	NO	NO
24	PRAVEENKUMAR	20/M	78811	PROSEAL	E	1	25	96	102	105	110	132	73	93	129	80	95	130	83	97	132	86	101	NO	NO	NO	NO	NO	NO	NO	NO	NO
25	SIVAKUMAR	42/M	6E+05	PROSEAL	E	1	27	104	110	112	115	126	82	97	131	89	101	134	89	103	139	94	109	NO	NO	NO	NO	NO	NO	NO	NO	NO
26	PURUSHOTHAMAN	26/M	1156	PROSEAL	E	1	30	69	75	73	77	121	86	98	128	91	102	130	83	97	136	89	105	NO	NO	NO	NO	NO	NO	NO	NO	NO
27	UDAYAKUMAR	32/M	20292	PROSEAL	E	1	32	75	81	83	89	110	82	91	118	87	96	125	87	98	130	92	105	YES	NO	NO	NO	NO	NO	NO	NO	NO
28	KUMAR	29/M	39380	PROSEAL	E	1	24	85	91	90	92	108	72	84	120	76	89	127	80	94	133	100	111	NO	NO	YES	NO	NO	NO	NO	NO	NO
29	PETCHIMUTHU	37/M	41441	PROSEAL	E	1	20	97	104	104	108	103	77	86	109	81	89	116	81	91	121	87	98	NO	NO	NO	NO	NO	NO	NO	NO	NO
30	SUSILA	37/F	70839	PROSEAL	E	1	26	79	85	84	90	128	69	89	130	75	92	127	76	92	132	81	98	NO	NO	NO	NO	NO	NO	NO	NO	NO

ABBREVIATIONS

ABBREVIATIONS USED FOR CHART

EOI	–	Ease of insertion
HOV	–	Hoarseness of voice
NOA	–	No of attempts
TTI	–	Time to insertion
BL	–	Base line
DR	–	Device removal
SYS	–	Systolic blood pressure
DIA	–	Diastolic blood pressure
MAP	–	Mean blood pressure
BS	–	Blood stain
RG	–	Regurgitation
ST	–	Sore throat
BS	–	Bronchospasm
LS	–	Laryngospasm
TI	–	Traumatic injury
CH	–	Cough
VG	–	Vomiting

ABBREVIATION

LMA	–	Laryngeal mask airway
PLMA	–	Proseal Laryngeal mask airway
ETT	–	Endotracheal tube
SD	–	Standard deviation
ILMA	–	Intubating Laryngeal mask airway
ID	–	Internal diameter
SLIPA	–	Streamlined liner of the Pharyngeal airway
ECG	–	Electro cardiogram
IPPV	–	Intermittent positive pressure ventilation
SGD	–	Supraglottic airway device
IV	-	Intravenously
ALMA	-	Ambu laryngeal mask airway